Products Finishing

FRED W. VOGEL, Editor

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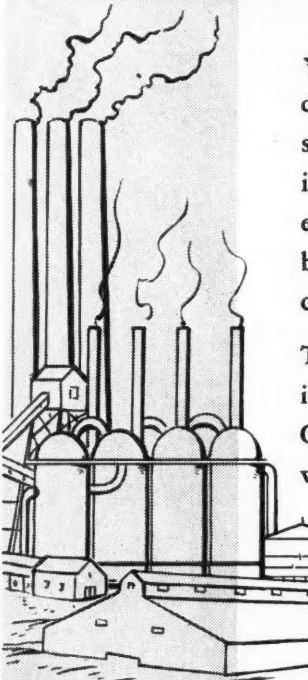

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Products Finishing

ACCORDING to a report in the Technical News Bulletin, Charles Kasper, of the National Bureau of Standards, has prepared a paper which deals with the theory of the potential and the technical practice of electrodeposition and more specifically with systems represented by various types of rectangular enclosures with enclosed line electrodes. The paper shows how these systems can be used to analyze such problems in electrodeposition as uniform plating of a circular cylinder with an enclosing anode in the form of a square, the use of a wedge to plate an internal right angle and the curvature that the apex of the angle must have to make this procedure practicable, and the effectiveness of insulating one wall of a sharp right angle to obtain uniform current distribution over the other wall.

The paper has an extensive section in which is given the purely mathematical treatment of some of the problems involving the theory of the potential as applied to rectangular systems with enclosed line electrodes. This treatment includes some original solutions in addition to a concise record of earlier mathematical developments which make possible the analyses used for illustration.

The paper is illustrated with figures showing current flow, the configuration of equipotential surfaces, and current distribution which exists in model systems. The figures are mathematically derived and are intended to illustrate the opportunities for advancement which are possible if a fundamental approach to problems in electroplating is substituted for the oversimplified notions too often employed for the instruction in applied electricity, and too much in evidence in the literature of electrodeposition.

Lockh

Streamlined Pr

By FRED M. BURT

ON a future day, some enterprising writer may unearth yellowed newspapers of the present and conceive the idea of writing a history of the United States. In perusing the records of the past, he would frequently encounter the name of a mysterious saboteur "Bottleneck," and he would, in all probability, come to think of it as some sort of superman whose destructive efforts wrought havoc in a thousand places at once until his action was impeded or inhibited altogether by antidotes called streamlining, speed-up, overtime, expansion, and so on.

In delving deeper, our writer would find mention of a bottleneck that moved in early in the finishing department of the Lockheed Aircraft Corporation plant, Burbank, California, but that this bottleneck ran head-on into a high-powered crew of antidote developers. The writer would also find information similar to that contained in this article—information revealing the manner in which this company overcame the bottleneck and then endeavored to prevent its return by providing means to cope with a four times greater production flow.

In short, this company which normally produces an adequate supply of high-quality aircraft found itself in February of this year sudden-

(Above Left)—A 212, adaptation of Lockheed 12, supplied to several military services.

(Left)—A YP-38 Pursuit Ship ordered by the U. S. Army.

ockheed Production Finishing

ly confronted with orders amounting to $343,280,000. A program of unprecedented expansion was imperative—a program which had to be made within the limits of a few short months. The question of the hour at Lockheed was "can the present finishing facilities meet the demands of this increased production?"

At first, the problem of how best to adapt existing equipment to the additional production spotlighted the program. However, new equipment had to be added, new methods of handling work devised, and new and faster finishing processes employed in order to cut down wasted time and space.

The main area of this plant which is devoted to the finishing department occupies approximately 9,000 sq. ft. of floor space. Included in this area is equipment for degreasing, cleaning, anodizing, finishing, and so on.

The metals employed in the construction of the modern aircraft manufactured in this plant include Dural castings — aluminum alloyed with copper and magnesium, Alclad sheet—a form of Dural stock which is covered and rolled in with a pure aluminum coating, steel, Inconel, and stainless steel, and each metal requires a separate and almost distinct finishing process.

The Dural and Alclad parts are anodized in an 8 to 10 per cent chromic acid solution. Some of the anodized parts are later coated with

(Above Right)—A Substratosphere XC-35 built for the U. S. Army.

(Right)—A B-14 Reconnaissance Bomber.

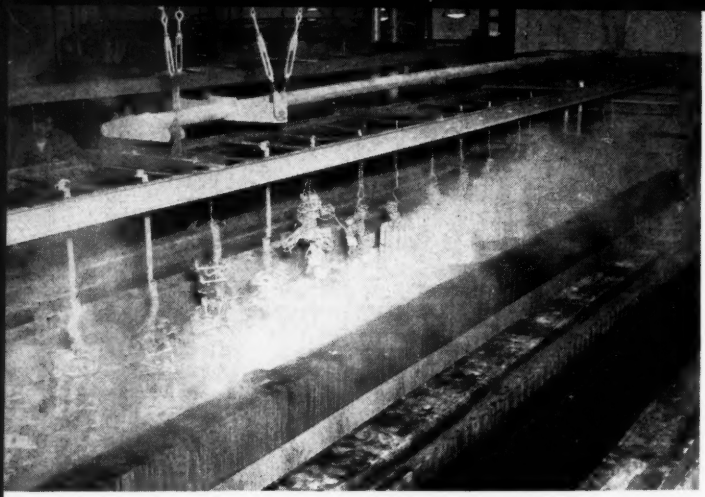

Fig. 1—A view of the tank in which the Dural castings are cleaned prior to anodic treatment.

finishing materials to provide for maximum corrosion resistance and also to change the surface appearance where colors are desired. The steel parts are sandblasted after heat treatment and then given the protection provided by chromium or cadmium plating, or paint. Inconel and stainless steel parts are cleaned before painting in a Detrex Degreaser in which Perm-A-Clor solvent is used.

Separate cycles of anodic treating are maintained for Dural castings and the Alclad sheets. The chief difference between the two cycles being in the temperature of the cleaning and rinsing solutions which is 170 deg. for the Dural castings in the cleaning and rinsing tanks and 140 deg. for the Alclad sheet parts. The center of operations in the anodizing department consists of three tanks, the interior of each measuring 21 ft. in length, 4 ft. in width, and 7 ft. in depth. As the parts and assemblies arrive in this department, the operator hangs them on copper frame racks which have lengths and widths approximately that of the tanks. The racks which have lengths and widths monorails which serve to transport them from one tank to another.

The first step in the process, after a frame has been loaded with workpieces, is a cleaning operation. The first tank is filled with an acid-type emulsifying cleaner. Fig. 1 shows a view of the cleaning tank in which the Dural castings are cleaned prior to anodic treatment and Fig. 2 shows a view of the

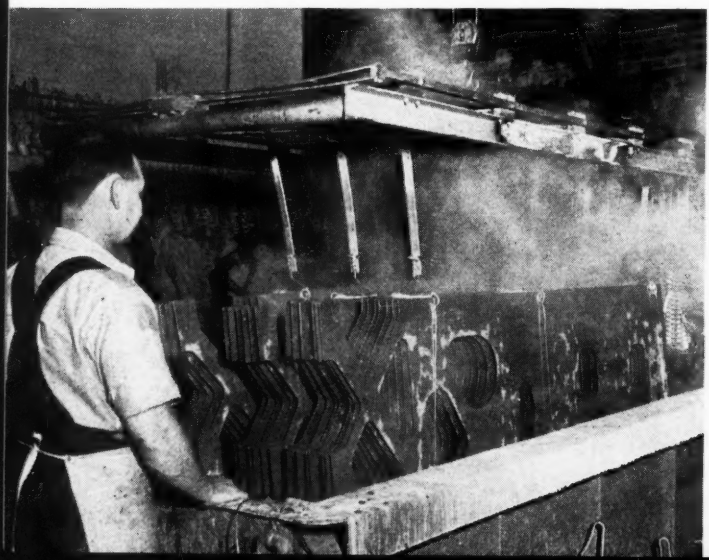

Fig. 2 — Illustration showing the Alclad sheet cleaning tank.

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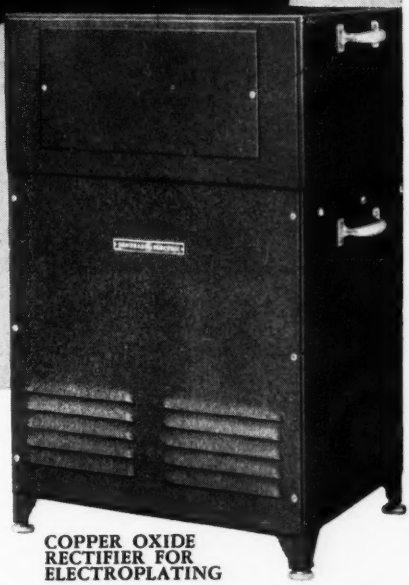

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GENERAL ELECTRIC

Fig. 3 — A view of the loading end of the continuous finishing conveyor line.

Alclad sheet part cleaning tank.

The overhead monorail tram which conveys the racked workpieces is operated electrically. By pressing a button, the operator can move a frame of workpieces to the cleaning tank. Pressing another button lowers the parts into a cleaning bath which is agitated by the action of air entering through vents located in the side of the tank. The solution in the cleaning tank is electrically heated to a temperature of 160 deg. F. Accurate control of the temperature of all the tanks in this department is assured through the use of Bristol Thermometers.

After remaining in the cleaning tank for 15 minutes, the frame and its load are moved to a middle tank where the parts and assemblies are rinsed in a hot water bath maintained at a constant temperature. Approximately three minutes is required for thorough rinsing.

The parts and assemblies are then conveyed to a third tank where the anodization takes place. The actual anodization process requires approximately 42 minutes. The current for this tank is gradually stepped-up for the first seven minutes from a voltage of 0 to 40 where it remains for 35 minutes. The progressive increase of the voltage from 0 to 40 is made necessary by an increasing resistance to the formation of the anodic film on the surface of the parts. A low amperage of approximately two amperes per square foot is maintained.

At the completion of the anodic treatment, the frame and its load are carried back to a rinse bath. Following this second rinse, the parts are suspended in air to dry and then transferred to the paint department which adjoins the anodization department, or to some other department to complete assembly.

The various paint finishes, of which zinc chromate primer predominates, are as follows:

Code No.	Finish Scheme
1	Primer.
2	Aluminized Lacquer.
3	Lacquer, Clear or Color.
4	Wood Sealer.
5	Wood Stain.

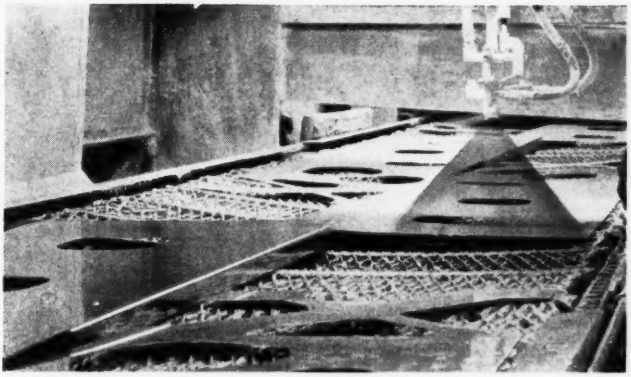


Fig. 4—As the parts pass along on the wire belt conveyor into the spray booth shown here, a spray nozzle shuttles back and forth and thus coats them with finishing material.

•

6 Varnish, Spar Glyceryl Phthalate.

7 Enamel, Synthetic Gloss or Color.

8 Wrinkle Enamel, Color.

9 Varnish, Aluminized Glyceryl Phthalate.

10 Acid Proof Lacquer.

30 Fine Chromate Sealing Compound.

40 Dope, Clear Nitrate.

50 Dope, Pigmented Nitrate (Color).

60 Enamel, Dull Black Baking.

70 Yellow Green Primer.

X1 Dark Earth Camouflage Material.

X2 Dark Green Camouflage Material.

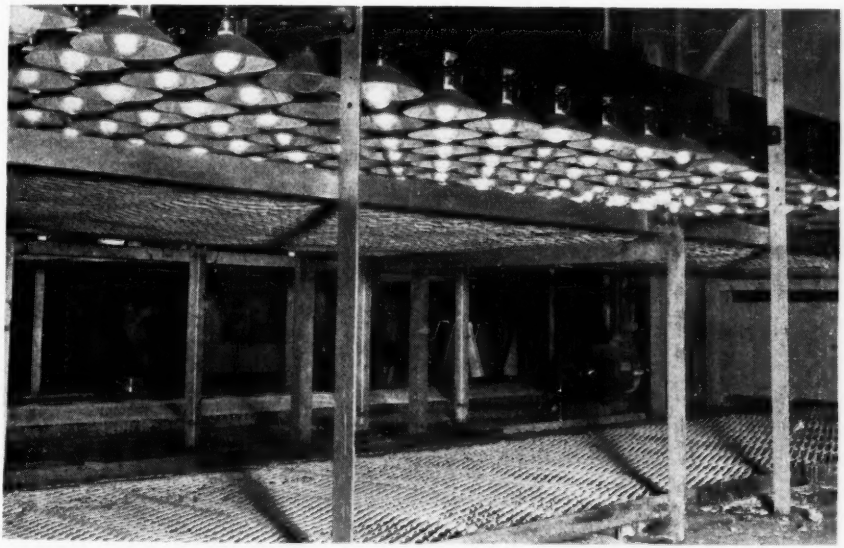
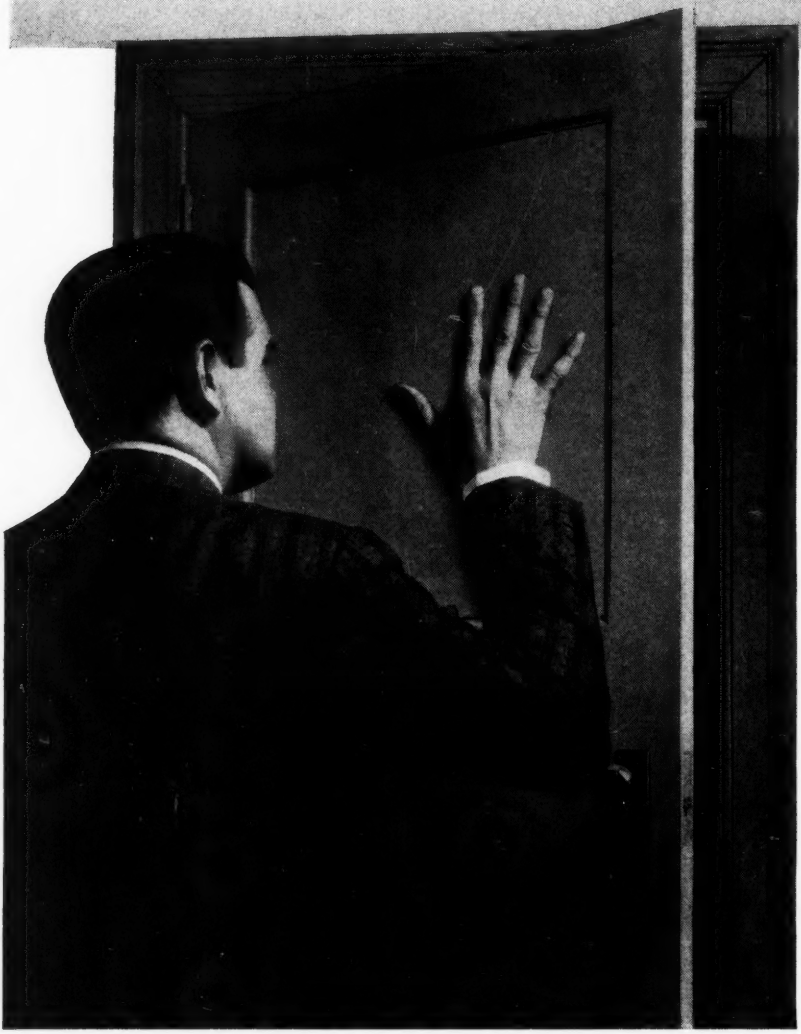


Fig. 5—The finished workpieces pass beneath the bank of infra-red drying lamps shown in this illustration.

HE SHUT THE DOOR



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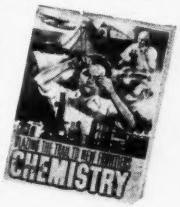

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In the old spray painting set-up that constituted a bad bottleneck, there were three spray booths with four men working eight hours on the day shift and three on the night shift. Floor space would not accommodate racks and drying facilities for increased production. However, with the new Lockheed-DeVilbiss engineered and DeVilbiss equipped layout, 8 spray operators work 8 hours each on day and night shifts and 6½ hours on a third shift, with additional space for four more operators. Four more operators can be accommodated at each of the two 40 ft. water-wash spray booths and two at each of the continuous conveyor lines.

Figure 3 shows a view of the loading end of one continuous finishing line. The operator shown in this illustration can be seen placing the workpieces on a wire belt conveyor of the finishing unit. These pieces will pass into the unit shown at the left where they will be coated by means of the automatic spraying unit shown in Fig. 4. The conveyor which carries the pieces into the finishing unit is made of galvanized wire four feet wide and 64 ft. long and driven at a variable speed of from 14 to 35 ft. per minute.

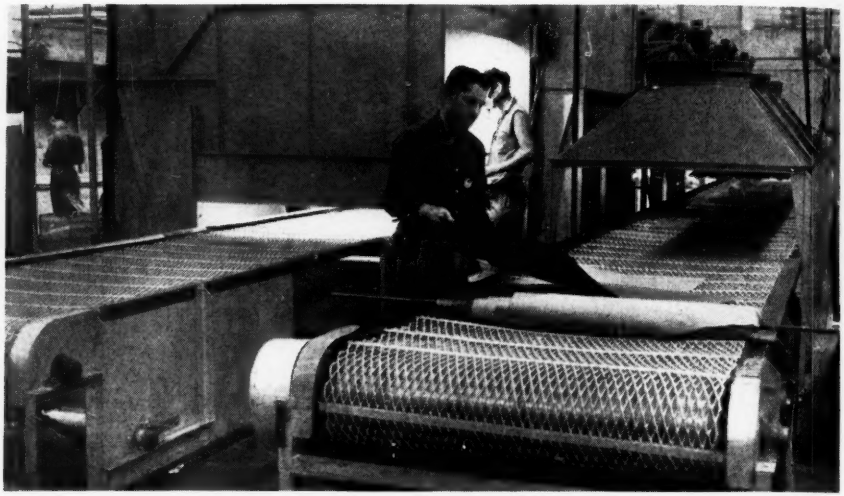

Fig. 6—After drying, the finished workpieces pass through a cooling zone which is shown in this illustration.

The spray booth shown in Fig. 4 is equipped for both hand and automatic spraying. The unit shown is a special transverse type automatic spray machine for 48 in. maximum width and is complete with adjustable cams and spray gun control valve. The unit is driven by a ½ h.p. explosion-proof ball bearing motor. The transverse speed of the shuttle spray gun is from 25 to 60 strokes per minute.

The booth shown in Fig. 4 is built

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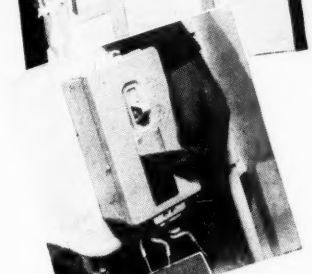

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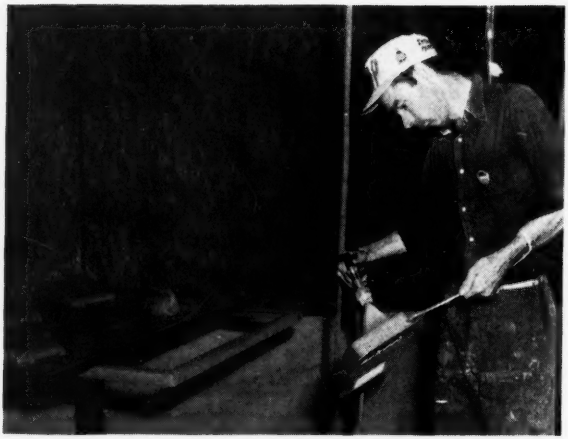

Fig. 7—Parts which cannot be conveniently handled on the automatic conveyor are finished in a spray booth as shown herewith.

for possible future installation of photo-electric control. A control system of this type would have two photo-electric relays mounted above the conveyor system at the entrance end of the spray booth. A piece of work on the moving conveyor built would interrupt a beam of light, thus setting off a relay system which in turn would activate the spraying mechanism just as the work reached it.

With no other work on the belt to interrupt the light beam, the relay system would again turn off the spray guns immediately after the work passed beyond the limits of the gun.

Following the automatic finish application spray booth, the conveyor carries the workpieces beneath a battery of infra-red drying lamps. Included in the battery of lamps are 22 transverse groups of six reflectors each, as shown in Fig. 5. The sprayed sheets are carried beneath this bank of lamps at the rate of 30 ft. per minute. The time required for baking does not exceed 30 seconds, while the temperature of the work does not exceed 125 deg. F.

After the baking operation, a 15-ft. cooling zone is provided. A view of the cooling zone is shown in Fig. 6. The cooling zone consists primarily of three separate fan units which are housed in a sheet metal canopy. The three fans are each 24 in. in diameter with a capacity of 5,200 cu. ft. of air per minute.

Figure 6 also shows the location of the transfer station where the operator removes the workpieces which have been finished on one side and places them on the conveyor on which they will receive a finish coating on the other side. Figure 7 shows a view of an operator working in the 40 ft. sectional water-wash spray booth. Workpieces which cannot be conveniently finished by means of the automatic spray unit are finished in this booth.

Figure 8 shows a cross-sectional drawing of a wall type water-wash spray booth. The design of this booth shows an elevated standard wet section located in front of a straight wash-down, water curtain. The water curtain is provided by the return drain of the water from the spray nozzles to the water tank. A long row of high velocity, fine atomizing, and non-clogging nozzles spray the water downwards toward the bottom of the tank. Over-spray from the operator's spray gun strikes the water curtain located at the rear of the booth and is drawn downward into a

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reservoir located at the bottom. Paint laden air which is drawn through the exhaust stack located at

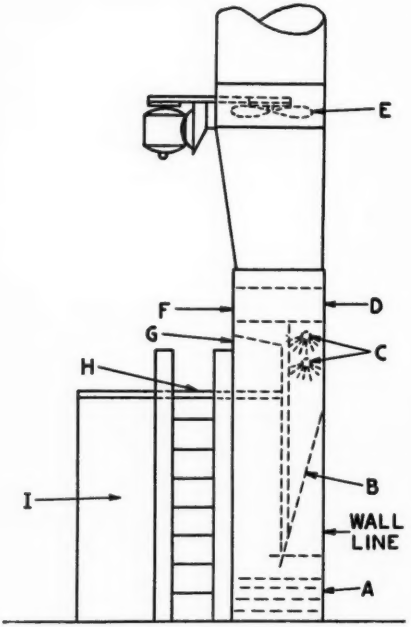

Fig. 8—A cross sectional sketch of a water-wash type spray booth. A—Water tank. B—Water-wash section. C—High velocity spray nozzle line. D—Low resistance eliminators to clean air and reclaim water. E—V-belt driven fan in exhaust pipe leading to roof. F—Eliminator access. G—Nozzle access. H—Catwalk with ladder at one end. I—Large unobstructed working space.

the top of the booth is pulled through eliminator packs before it is exhausted into the outer air. This design provides effective booth depth and at the same time permits the booth to be built against the wall.

Hercules Cellulose Acetate. A new booklet on cellulose acetate is now being issued by Hercules Powder Company, Delaware Trust Bldg., Wilmington, Del., giving data on properties, application and formulation of the material in the plastics, lacquer, film, foil, paper, electrical, automobile and other fields.

The booklet contains tables on physical properties, film characteristics, solvents, resins, plasticizers, for use with cellulose acetate, and properties of lacquer films. Charts of viscosity concentration curves, of the water absorption of cellulose acetate plastics of varying acetylation, and a blending chart for different viscosities are given.

Data on melting point, density, refractive index, optical and electrical properties and water and chemical resistance are included. The booklet also covers the application, formulation and spraying of cellulose acetate lacquers. Plasticizers, formulation, thermal properties, color, water resistance, finishing and production of cellulose acetate plastics are discussed.

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How to Clean Copper and Zinc Alloys. How to clean copper and zinc alloys for better plate adhesion is described in a four-page feature article appearing in a recent issue of "Oakite News Service" published by Oakite Products, Inc., 20 Thames St., New York City. The procedure is said to be especially designed for cleaning brass, copper, and zinc alloys before plating and to provide more certain and complete removal of oil, grease, smutty deposits, and soap films.

Written by Mr. E. C. Rinker, of the Oakite Research Laboratories, the article states that this new method consists of three principal steps: (1) effective pre-cleaning of work either with an emulsifying solvent or an alkaline compound, depending upon the condition and shape of the work; (2) anodic cleaning with an alkaline electrocleaner designed specifically for this purpose; and (3), sulfuric acid dip. Rinsing, of course, follows each operation.

In addition to removal of foreign matter, this new cleaning process is also said to prevent formation of soap films when the cleaner becomes contaminated with soap and to provide other substantial advantages.

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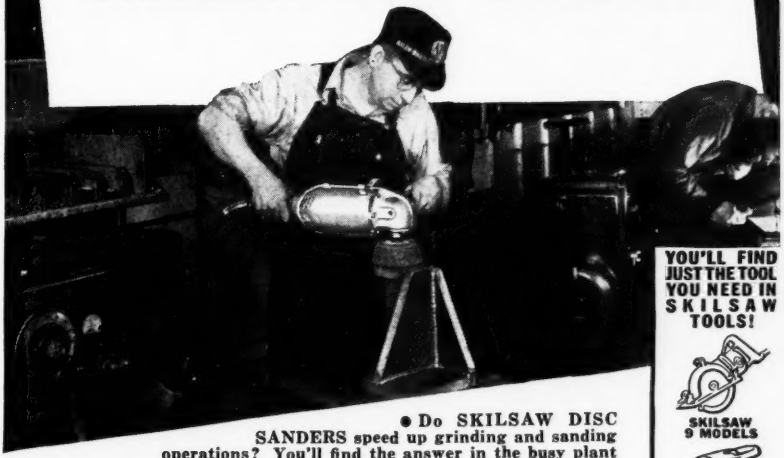

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Modern Gold Plating

By JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

DRAGOUT, whether in barrel, still or automatic tank gold plating, is a subject that should be of vital interest to the gold plater, yet it is rarely considered or taken into account. Admittedly a small item, this small item can be the cause of large losses to the gold plater. Indeed, cases are on record where in some gold plating installations more gold is lost wastefully by dragout than is used productively in plating. In some gold plating plants losses of this type can aggregate to thousands of dollars yearly.

Losses by dragout can be particularly bad in gold barrel plating. This one item alone is often the thing that prevents the adoption of gold barrel plating in places where it could do the most good. A manufacturer considering the installation of a gold plating barrel remembers some of the nickel and copper plating barrels he has seen in operation, remembers the Niagara of electrolyte dripping from the barrel load as it headed for the running water rinse or recalls the tremendous splashing set up by emptying a tilt type barrel and he mentally says, "Plate gold that way? Not for me!"

This source of loss in gold plating, whether in barrel, still or automatic tank, which is so often overlooked by the plater, can be controlled and losses caused by it can be reduced to a happy minimum or recovered almost completely if proper precautions are taken. Unfortunately, however, dragout is usually a guesswork proposition in the plating room, so the gold plater or manufacturer knows very little about just how much gold he is losing by dragout, or recovering, if any is being recovered. For this reason, we have decided to spend a little time on this woefully neglected subject.

We will first consider a case history taken from an actual barrel gold plating operation that will give some idea of the magnitude of dragout and the losses it entails.

The barrel illustrated in Figs. 31 and 32 is an eight-compartment barrel with cross wire contacts, specially designed for the plating of small objects with definite amounts of gold. Each compartment holds approximately a quarter pound of small buckles, pins and tongues, the components of wrist watch straps, and when fully loaded the total weight of

Part 8

work is about 2 lbs. The capacity of the gold plating tank in which it runs is 15 gallons and the concentration of gold in the tank is .2 oz. per gal. This concentration is rigidly maintained by the addition of gold in solution form, after every run of the barrel. The typical run is from 7 to 10 minutes, during which period of time 1/40 of the weight of the load is deposited as gold.

By actual test and measurement it was determined the average loss of gold by dragout per run made, when following a certain set procedure of draining and rinsing, was .007 ounces.

Just what does this mean in terms of liquid lost from the plating bath and in money wasted? If the dragout loss is .007 oz. of gold and the concentration of gold in the plating tank is .2 oz. per gallon, then the amount of liquid that has been lost through dragout is $\frac{.007}{.2} = .035$ gallons, approximately 130 cc. per run. The whole plating tank has a content of 15 gallons, so the percentage of liquid lost is $\frac{.035}{15} \times 100 = .23$ per cent which for round figures we will call .2 per cent. This figure, which looks so small, is an item to think about. It means that after 500 runs of the barrel, the 15-gallon gold plating bath will have been completely emptied into the drain.

If 20 runs are made daily, then at the end of a working year of 300 days there will have been lost just about 35 x .007 x 20 x 300 = $1,470. Of course, a considerable portion of this can be and is saved by proper recovery measures, but very often a gold plater under similar circumstances will imagine he is using the proper method for recovering his dragout losses although unknowingly he may be losing practically the same amount of metal down the drain as he did before he instituted recovery measures. This will be shown and proved in the next few paragraphs.

Just what is dragout? Dragout is the volume of liquid that is carried away by a plated object when it is removed from the plating bath. Essentially there are two reasons for its occurrence. The first one is a mechanical one; that is, pockets, hollows and recesses in the work, actually entrain and trap liquid which cannot be easily drained off or removed. The second one, is a physical cause; that is, the molecular forces of adhesion

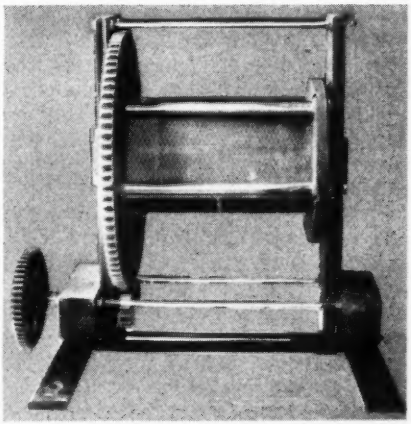

Fig. 31—Special design compartment barrel for gold plating.
(Photo Courtesy Tri-Pact Plating Company)

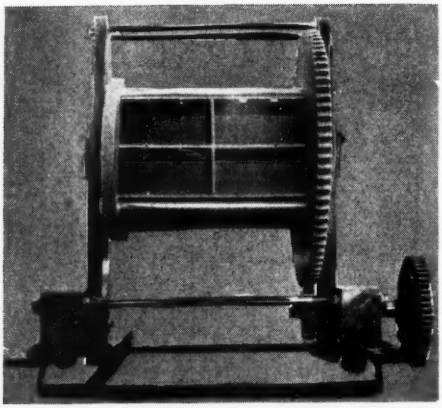

Fig. 32—Illustration showing four compartments of a special design eight-compartment gold plating barrel. Note cross wire contacts.
(Photo Courtesy Tri-Pact Plating Company)

and attraction, which cause wetting, or the formation of a film of liquid over the work as it is removed from the plating bath.

Simple as the problem seems to be, there is far more to it than meets the eye at first glance. From the mechanical standpoint, changes can be made in both the design of the work and the method of handling it so as to greatly reduce dragout from this factor; from the physical standpoint, changes in density, viscosity and surface tension as well as in time cycle may also largely effect dragout. Furthermore, there are ways and methods for recovering dragout loss that are really effective and there are ways that are not. All in all, it is a subject that warrants some mathematical discussion, since the mathematics involved is fairly simple and we can arrive at some rather interesting and practical conclusion as a result of it. If you do not care to follow the trials and tribulations of our mathematical guinea pig, Mr. G. P., a costume jewelry production plater with a five-gallon pot of gold solution, you can skip this section and pass right on to the practical conclusion department which follows close on its heels. So hold on now. Here we go.

Case One: Mr. G. P. Uses No Recovery Rinse

Let us start with the simplest of facts. A pot of gold plating solution, a plater and a string of wired work. Let the concentration of gold in the solution be C ounces per gallon and the volume of the plating solution be V. The string, which we can assume is the average string of work, has just been dipped into a running water rinse after the last cleaning dip, and with water dripping from it, is put into the pot to be gold flashed. A couple of taps on the wire—a matter of ten seconds or so—and it is taken out and placed in the running water rinse and thence to the sawdust. This is our elementary drag-out cycle as illustrated in Figure 33.

The work on the wire string coming into the plating pot from the water rinse carries with it a certain volume of clear water which we can call drag-in or carry-over, of average volume v. Removing the work from the pot, we carry out about the same volume of gold plating solution, assuming all other things being equal such as time of immersion drainage and so on, which they generally are in a busy shop. Actually, the amount of liquid carried out may be more than the amount carried in because of the gold solution's higher viscosity, and so on, but for purposes of simplification we will assume that both volumes are equal; that is, drag-in is equal to dragout. Another assumption we are going to have to make for our simplest case, is that the plater replenishes the gold plating bath often enough to maintain the

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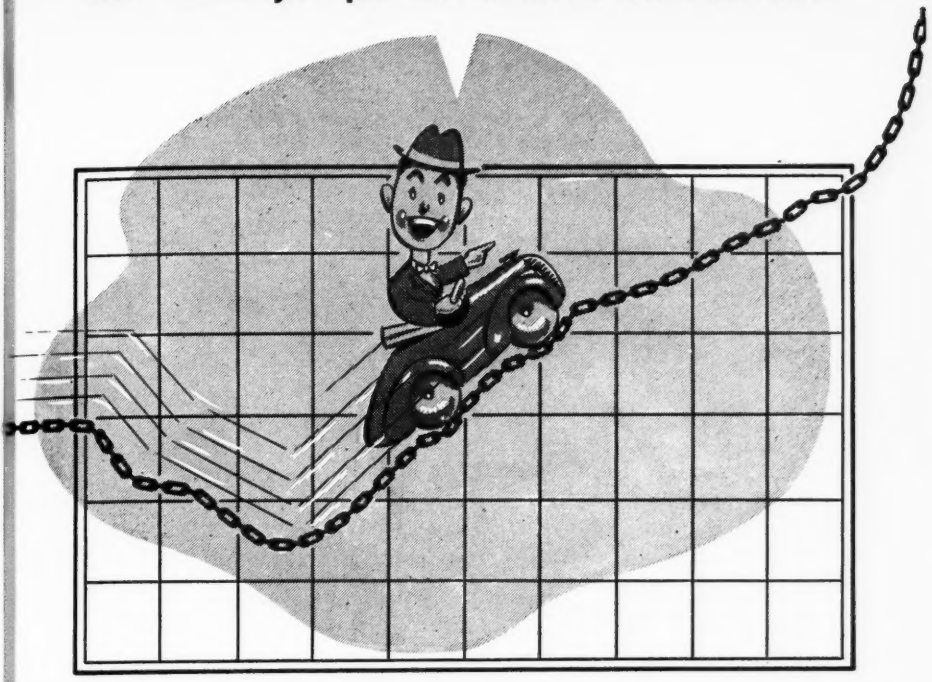

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concentration of gold in the pot, C, at a constant level, insoluble anodes being used. In actual practice this almost never occurs, since the gold is permitted to run down to the vanishing point.

With all these factors noted and marked, then if Mr. G. P. plates n strings of work daily, at the end of the day he has removed from the bath, by simple arithmetic,

(1) $n \times v \times C$ ounces of gold.

Just how much gold is lost daily depends on the volume of dragout per string (v), the number of strings plated and the concentration of gold that is maintained in the pot. To put in a few sample figures: with a gold concentration of .2 ounces per gal. and a dragout volume (v) of .0005 gallons per string of work, this is about 1.8 cc. which is not at all excessive in actual practice, and 1,000 strings of work plated daily we get:

Gold lost daily $=$ 1,000 x .0005 x .2 $=$ .1 oz.

This amount of gold in solution is worth at least $3.50 because even though G. P. buys his gold at $35 a troy ounce and cuts it down himself it costs him a bit more than that before he gets it into solution. At the end of a year of 300 working days, Mr. G. P. has lost exactly

300 x 3.50 $=$ $1,050!

Case Two: Mr. G. P. Uses a Dragout Recovery Rinse

Our mathematical guinea pig on learning of his unnecessary loss of money because of dragout decides to install a recovery rinse tank because some time back a friendly supply salesman gave him the tip. The man told him it was the latest thing and would save him money. G. P. figures he'll try it. Therefore, he buys a small pot of volume W which he fills up with fresh water. He places it next to the gold plating tank and when the work is pulled out of the plating bath dripping with gold solutions, he quickly dips the work into the recovery pot and pulls it out again, headed for the general direction of the drain, as before.

In principle the thing seems swell. You wash off all the gold in the clear water and it remains in the recovery pot; what you take away from there amounts to nothing at all. Every once in a while, if you don't forget, you can dump the contents of the recovery back into the gold bath or down into the sweeps and you don't lose a thing. That's what you think, mister!

According to this new schedule that $1,050 yearly loss should have been recovered completely. Let's see.

Consider the cycle at the recovery rinse tank as illustrated in Fig. 34. On going into the recovery rinse which is filled with pure water at the start, for the first time, and every time thereafter we bring to it with each string of work, vC ounces of gold. What we take out when we go out of the recovery pot, varies. The first time we take out $\frac{v.\,vC}{W+v}$ ounces of gold and we have left $\frac{W.\,vC}{W+v}$ ounces in the recovery pot; the second time we take out the same fraction $\frac{v}{W+v}$ of what we have left from the first time plus the new quantity of metal we have just brought in, that is, $\frac{v}{W+v}\left(\frac{WvC}{W+v} + vC\right)$ and we have left in the pot $\frac{W\,vC}{W+v}$

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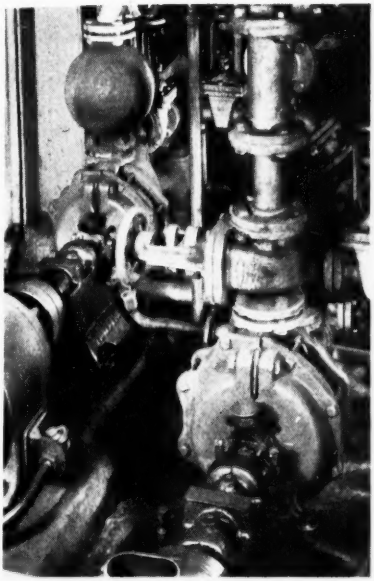

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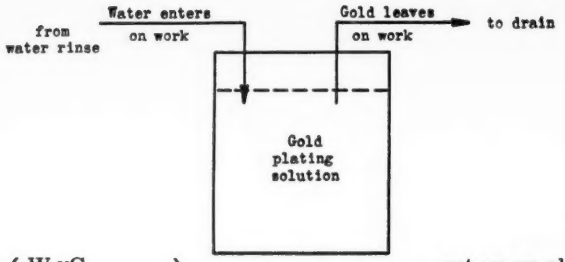

Fig. 33 — Illustration of an elementary dragout cycle.

$$\left(\frac{W\,vC}{W+v} + vC\right)$$

With the third string, the going gets a little cumbersome, mathematically speaking, but a little grouping together if you have a lot of space on your note paper will show you that we are getting a simple geometrical series, which if we call the fraction $\frac{W}{W+v}$, and using A for simplicity, will look something like this:

(3) Total amount of gold remaining in recovery rinse tank after n strings of work go through it,

$$R, = vC\,(A + A^2 + A^3 \ldots + A^n)$$

The series in the parentheses is a simple geometrical series and by thumbing the pages of your old algebra you'll soon come across the formula that gives the sum of this series. With a little manipulating and changing back A to its original form we get as the final result

$$(4)\quad R = WC\left(1 - \frac{1}{(1+v)^n \over W}\right)$$

This looks pretty fearsome but it really isn't. If we remember that v/W is a very small quantity, we can approximate the expression that has to be raised to the nth power, as $\frac{(1+nv)}{W}$. If we simplify this still further by multiplying through by this term, we get as a final result:

$$(5)\quad R = WC\,\frac{(nv)}{W+nv}$$

We are now in a position to try this formula out on on old G. P. Let us assume that the size of the recovery pot he bought is 2 gallons (W = 2) and using the other figures as in the first example and substituting in formula 5, we find at the end of the first day the recovery pot is holding

$$R = 2 \times .2\,\left(\frac{1{,}000 \times .0005}{2 + 1{,}000 \times .0005}\right)$$

$$= .08 \text{ oz. gold.}$$

Now if he didn't have the recovery rinse he would have lost .1 oz. of gold, as shown by the previous example, so he has saved .08/.1 or 80 per cent the first day, which looks pretty good.

But if our guinea pig does not pour back the recovery rinse into the gold plating bath or into the sweeps at the end of the first day, but continues using it as is the common practice, figuring that he collects the gold in it anyway. At the end of the second day he has left in the recovery pot:

$$R = 2 \times .2\,\left(\frac{2{,}000 \times .0005}{2 + 2{,}000 \times .0005}\right)$$

$$= .133 \text{ oz. gold.}$$

If he had not used the pot at all he would have lost .2 oz. of gold by this time, so his saving is .133/.2 = 67 per cent. This is still all right but you can see now what is happening.

On the third day he still hasn't emptied the recovery rinse and put in fresh water, so at the end of that day he has in the recovery pot

$$R = 2 \times .2\,\left(\frac{3{,}000 \times .0005}{2 + 3{,}000 \times .0005}\right)$$

$$= .17 \text{ oz. gold.}$$

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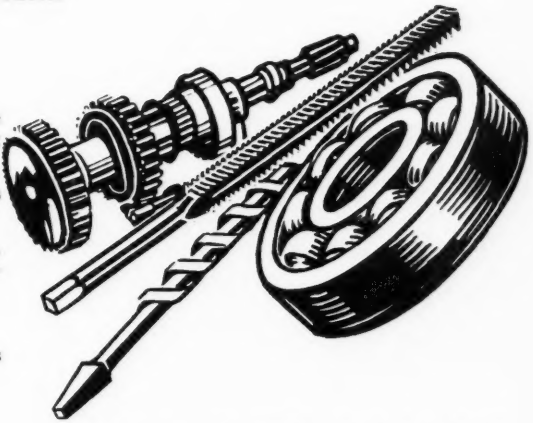

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Without the recovery pot he would have lost .3 oz. of gold, so the total overall saving is now .17/.3 = 56.5 per cent. Going down.

If the recovery pot is not emptied and renewed with fresh water very soon, in another few days, Mr. G. P. won't be saving a nickel. Our guinea pig has arrived at the same concentration of gold in the recovery rinse tank as he has in his gold plating bath and so from this point on, the recovery rinse becomes an unneeded extra step in carrying the gold from the plating bath to the drain. Indeed, under conditions of this kind, particularly in flash and dip gilding, what with evaporation, the recovery crock becomes a better plating bath than the plating solution itself because it has a higher concentration of gold. Such cases are not at all unusual.

The actual metal lost from the gold plating bath over a given run can be determined by the formula below.

$$(6)\quad \text{Metal lost, } L = nvC\,W - WC\left(\frac{nv}{W+nv}\right)$$

From this you can see at once that if n, the number of strings plated, becomes large enough before the recovery crock is emptied and renewed, the quantity in the parentheses becomes approximately equal to unity so the resulting formula, in this case, can be stated as

$$(7)\quad L = nvC - WC = C\,(nv - W)$$

If Mr. G. P. renewed his recovery rinse with fresh water every 100 days, let us say, then his loss for that period would be:

$$L = .2\ (100{,}000 \times .0005 - 2)$$
$$= .96 \text{ ounces.}$$

And his yearly loss would be 9.6 x 3 = 28.8 ounces of gold. If he had not used the recovery pot, as in the first example, his yearly loss would have been 300 x 1,000 x .0005 x .2 = 30 ounces of gold. All Mr. G. P. saved over the whole year then was 1.2 ounces of gold, about $42, and he lost $1,008. That's a percentage saving of .67 per cent. So why did he bother with a recovery rinse tank in the first place? We ask you.

Practical Results

The lessons the gold plater who is interested in saving a substantial amount of gold that is unnecessarily lost through dragout can learn from these preliminary, simple analyses are these:

(1) **Keep the concentration of gold in the plating bath as low as possible and compatible with good plating.** If for example in a given plating operation the gold concentration is .4 oz. per gal. and it can be reduced safely to .2 oz. per gal., the immediate and automatic saving in dragout is 50 per cent.

(2) **Change the water in the recovery rinse tank as often as is possible and convenient.** This is the

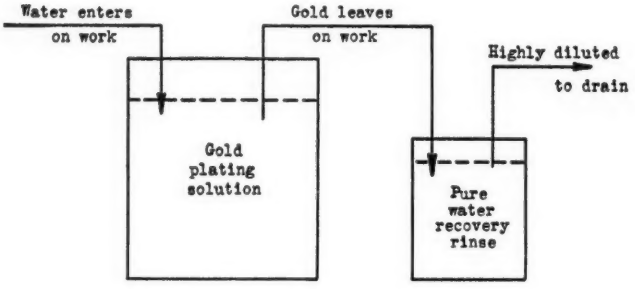

Fig. 34—Illustration of a dragout cycle with one recovery rinse tank.

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most important point of all. It is the crux of the whole analysis. **It isn't enough to have a recovery rinse tank. You must make correct use of it by renewing it with fresh water as frequently as possible.** This is the point on which most gold platers fall down. If Mr. G. P. had renewed his rinse crock every day he would have saved 80 per cent of that $1,050 loss and not the insignificant .67 per cent that he did. In fact, if he had poured the rinse water off and renewed with fresh water two times a day, he would have saved 88 per cent, as a little figuring will show. Of course, it is understood a plater cannot be continually emptying the recovery rinse tank into the plating bath or the sweeps, but there is a happy medium between labor time spent, storage costs, and gold wasted.

(3) **Use a recovery rinse tank of the largest possible convenient size.** Better still, use two or three rinse tanks in a row, going from one to the other before going to the drain. But here, too, you must change the rinse water as often as possible or else the whole system is not worth much. If Mr. G. P. had used a 4-gallon recovery rinse tank instead of a 2-gallon pot with other conditions being the same, he would have saved, as substitution into formula No. 5 proves, about 88 per cent the first day instead of 80 per cent.

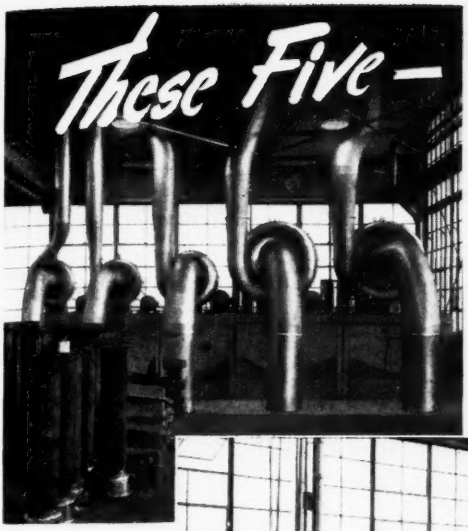
(4) **Reduce your dragout volume (v) to its minimum value.** This involves corrections of a mechanical nature to reduce dragout, such as changes in designs or improved handling methods, longer drainage periods and the like. Of course, there is a certain optimum period above which increasing the drainage period for example, will do no good, since the labor time involved is worth more than the gold saved. This optimum value can be computed if the other factors are known.

These are the practical results of our first two mathmatical analyses and they indicate in general what can be done to really recover some of the money that is lost down the drain through dragout. The analyses, of course, have been based on ideal cases. In actual practice Mr. G. P. does not in most circumstances replenish the gold at all but lets the bath ride to the bitter end until he can just barely squeeze out a gold color. This introduces a number of complications, but even in this case, which is much more complex mathematically, it can be shown that the practical principles enumerated above still hold. We would like to go into the analysis of this more complicated case as well as an analysis of just how much better two rinse tanks are than one and three better than two, but will not do so unless some interest is shown in these cases, since they are rather involved.

Determination of Dragout Volume

There are a number of ways in which v, the average volume of dragout per string, rack, or load of work plated can be determine, but the simplest one is probably the one suggested by the writer some time ago[1]. It enables the gold plater to obtain a fairly good approximation of v and with this value once known he can, from the other known factors such as concentration of gold in the plating bath and number of loads plated daily, compute his dragout losses according to the formulas given previously.

The method is simply this. Place a rinse crock containing a measured volume of fresh water immediately next to the gold plating bath. The crock should be sufficiently large to hold the rack, string or type of load



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being plated. Start the plating operations as usual and instead of going out of the gold plating bath directly to the drain or recovery rinse, go immediately into the crock and swill the load around for a moment or two, then remove just as you removed it from the plating bath, and let it go on its usual course. Treat about 100 or so loads of work this way, then take a sample of the crock water for analysis to determine the gold content. If you know what the gold concentration is in your plating bath and the concentration of gold in the rinse, you can determine the average dragout volume per load (v) by substituting in this formula:

$$(8) \quad v = \frac{W C_r}{n C}$$

where W is the volume in gallons of the crock water, n is the number of loads or wires plated, C_r is the concentration of gold in the crock and C is the concentration of gold in the plating bath.

If, as is the usual case, no analysis can be or is made of the gold content, a hydrometer can be used with pretty good results to determine the relative concentration, since the weight of a substance dissolved in water varies roughly with the specific gravity of its solution minus unity. In this particular case, start making the test when you have just made up a fresh gold bath. Dip the Baume hydrometer, which should be an accurate one reading from about 1 to 10 deg. or so, into the gold plating solution and take a reading. Try to keep your eye as parallel with the liquid level as possible when reading the hydrometer, to avoid errors or parallax. After you have run about 100-200 loads of work through the test crock, take a hydrometer reading of the crock solution. From these two readings you can get the dragout volume (v) by substituting into the following formula:

$$(9) \quad v = \frac{W B_r (145 - B_t)}{n B_t (145 - B_r)}$$

where W and n have the same meanings as before and B_r is the Baume reading of the test crock solution and B_t is the Baume reading of the gold plating tank solution. Just to give an idea of the use of this little formula we will give a practical example.

Suppose the Baume reading of the gold plating tank solution is 4.80 and after 200 strings of work have gone through the test crock the Baume reading of the solution in it is .2; then the volume of dragout, if W is 4 gal.,

$$v = \frac{4 \times .2 \times (145 - 4.8)}{200 \times 4.8 \times (145 - .2)} = .0008 \text{ gal.}$$

Once you have this figure determined, you can compute by using the formulas given previously just about how much gold is being lost by dragout in a given period of time.

---

[1]Measurement of Dragout—Metal Industry, p. 332, July 1939.

"Semi-Conducting Rubber and Synthetic Rubber Compounds." A three page mimeographed reprint of an article on "Semi-Conducting Rubber and Synthetic Rubber Compounds" by A. E. Juve, of its mechanical division technical staff, has just been released by The B. F. Goodrich Company, 450 S. Main St., Akron, Ohio. The article was published in a recent issue of "India Rubber World" and discusses some of the most interesting developments in rubber technology in recent years. Requests should be sent to the Public Relations Department of the B. F. Goodrich Company.

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Finishing White Truck Ca

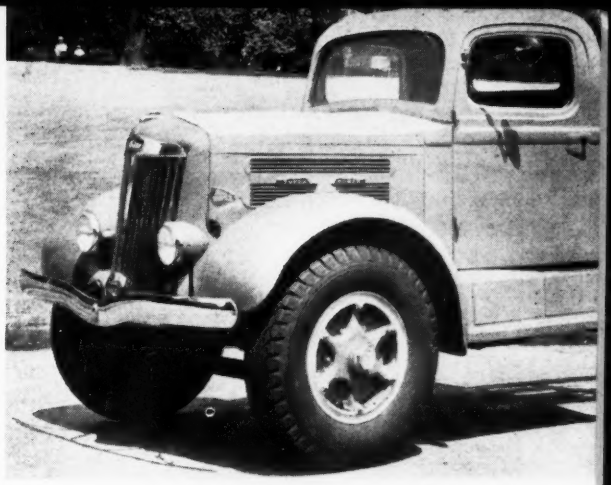
(Left)—Cab Over Engine Model White Built Truck

HANDCRAFTSMANSHIP is combined with modern tools and the assembly line technique to produce high quality cabs on a steady production schedule at The White Motor Company plant located in Cleveland, Ohio. Today, White operations are proceeding smoothly and cabs designed for all Super Power models, including both conventional and cab-over-engine types, are coming off the new line. Only craftsmen of long experience in body building are employed, and extreme care is exercised from start to finish. The well-known White emphasis on thorough inspection is apparent from receipts of raw materials to the final seal of approval. A trip along the line will expose something of the finishing methods and the quality of cab produced.

To begin with, all parts are fabricated within the White plant with the exception of the large steel panels which are made outside with White-owned dies. Except for the

Fig. 1—General view of the cab final assembly and prefinish assembly line.

uck Cabs



(Right)—Conventional Model White Built Cab

preliminary framing operations, accomplished on a major assembly fixture, work is done at various stations along a floor-type chain conveyor line which has a variable speed of from 6 in. to 18 in. per minute. Cabs are spaced on this line about every 8 feet. Many types of craftsmen are required during the building process including spot welders, arc welders, gas welders, panelers, torch solderers, metal finishers, door hangers, painters, fit-out men, and trimmers.

All panels, with the exception of flooring, are of 18-gauge steel — heavier than used by many builders. The incoming material is inspected according to predetermined standards, and finished according to B/P specifications.

A general view of the final assembly and prefinish line is shown in Fig. 1. In the first of a series of metal-finishing operations, the cabs are sanded with belt sanders, disc wheel sanders, and hand sandpaper as shown in Fig. 2. The cabs are washed with acid and thinner, preparing the metal for the paint, with full assurance that no rust will eat through later. The frames are given one coat of prime and one of enamel.

After a thorough cleaning, the cabs go to the prime spray booth shown in Fig. 3 for three successive

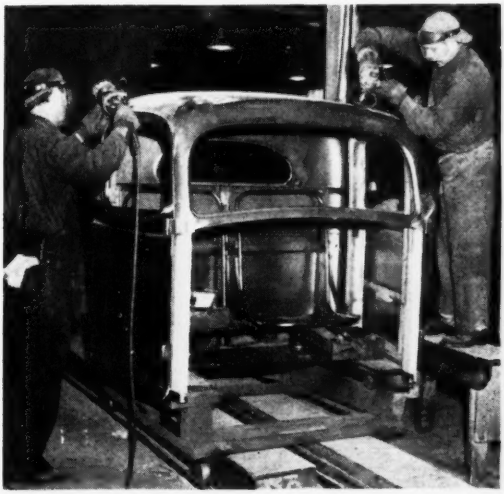


Fig. 2—Disc sanders are used in removing weld marks at seams and for smoothing dents and scratches.

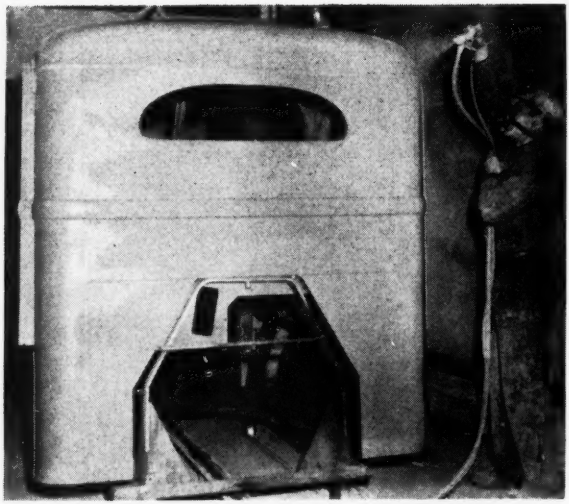


Fig. 3—The cabs are sprayed in a fully ventilated booth as shown in this illustration.

coats of prime on the outside and one on the interior. The conveyor line then takes them through an oven where they are baked for 50 minutes at 225 deg. F.

After the baking, the cabs are sanded to a satin finish by the workmen shown in Fig. 4. The conveyor line then makes a horseshoe turn and brings the cabs back through a finish spray booth, where they are given three coats of finish enamel, and through the other side of the oven where they are again baked for 50 minutes at 225 degrees.

As the cabs come from the final baking, one man installs the windshield while others install the hardware, inside door panels, moldings, glass, upholstery and lining. The windshield is set in dumdum with rubber molding overlapping for full seal. Tubular rubber lace is employed all around the door to keep the draft out, and the door itself is rimmed with rubber strip to insure against air and moisture. All cabs are water tested.

Rigid inspection is maintained all along the line. All functional parts such as doors and window regulators are given particular attention before the cabs are finally delivered to the chassis erection line. The finish is also checked by trained inspectors as shown in Fig. 5.

To a casual observer White has but two types of cab, the conventional and the cab-over-engine, but, in reality, it builds at least 300 different combinations of cabs depending upon

Fig. 4—A view showing workers sanding the cab after a coating of finishing material has been applied.

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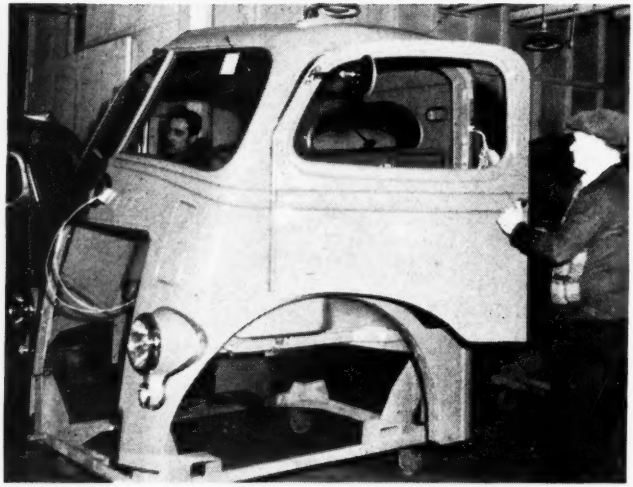

Fig. 5—At the end of the finishing line, an inspector carefully checks the quality of the surface finish.

customer demand and state regulation. For instance, in addition to the different types and sizes, there are the different colors available, different marker lights, different seat possibilities from the single to the three man seat, glass variations including sheet and plate combination or double plate, floor board variations, rear window variations, and all the accessory choices. When you multiply the possible combinations for conventional and COE, in gas or Diesel engine application, the complexity of the production schedule may be ascertained. Especially when you consider that, with the COE, numerous truck specifications are definitely tied into the construction of the cab. All this does not take into account the cabs built for military purposes. In some cases sectionalized cabs are constructed for export, so that they may be shipped by plane.

Regardless of the specification variations, it may be said that the completed White cab is a streamlined job, fully insulated against heat, cold and noise, air-conditioned for comfort, and finished to suit the most exacting operator. In short, it presents passenger car smoothness with the ruggedness demanded in a truck. While time and expense are considered, there is no sacrificing of quality in the crafting of White cabs. Built by experts, they must uphold the same level of reputation enjoyed by the famous White Super Power engines and the rugged frames which go to make up the complete White truck.

Lyon Material Handling Equipment. Circular No. 120 which briefly describes the various Lyon Material Handling Equipment, most of which is hydraulic, is now being issued by Lyon Iron Works, 664 Madison St., Greene, N. Y. Separate complete descriptive literature of any of the products shown on this circular are also available; Lyon Standard Hydraulic Lift Trucks; Lyon Pallet Type Hydraulic Lift Trucks for single or double faced pallets; Lyon Trucks with hydraulic elevating tables Centilever type; Lyon Trucks with hydraulic elevating tables, Toggle Lever type; Lyon Hydraulic Die Handling Trucks; Lyon Hydraulic Sheet Handling Trucks; Lyon Hydraulic Elevating Tables; Lyon Special Handling Equipment; and other material handling equipment such as Lyon Utility Trucks and Lyon Frame Skid Platforms.

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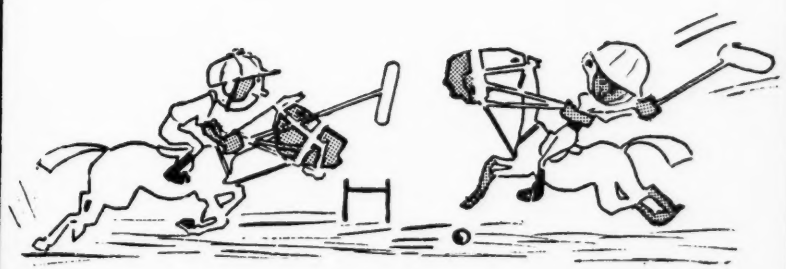

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Barrel Finishing of

The Case of Barrel Finishing versus Polishing and Finishing

By H. LEROY BEAVER

Barrel Finishing Consultant
Lansdale, Pennsylvania

IN spite of all the efforts we have made from time to time throughout this series to differentiate between barrel finishing and polishing and buffing operations we have apparently not made our meaning completely clear as to just what relation each of these operations bear to one another.

From time to time we are told in substance, that, "P o l i s h e r s are against barrel finishing or barrel burnishing as a method of metal finishing for the reason that it conflicts with their best interests," but with this idea or line of reasoning we cannot agree, and especially so when we regard an appropriate barrel finishing operation from its most important factors.

First, let us consider the average plated surface; that is, the deposit of metal which is electrically placed on the surface of a base metal principally for the purpose of protecting the less expensive base metal from corrosion by the elements, or perhaps in many cases solely for its ornamental value without regard to its value as a protective medium. Now let us first consider that admittedly all such electro-deposited coatings are porous, some authorities insisting that the degree of porosity on even what might be termed normal coatings will run anywhere from 36 to 360 pores per average decimeter square of surface area (roughly four inches square), and upwards from that figure to a point where the pores are too numerous to be counted.

If a metal coating has such imperfections, then its value as a device to protect the base metal is open to serious question. There must be something in this question of porosity or we would not have all the discussion that goes back and forth with regard to salt spray tests, and a vast multitude of other and varied tests that are made on plated surfaces to determine their true protective values. We have had more discussion on the value of salt spray tests within the past year or two than ever before, and even now, though porous coatings are to be expected, a considerable research is in process to set up plated panels of various kinds and variously plated in urban, rural and marine locations in an effort to seek a sort of cross-section of what the

corrosive action will be as gained from these varying exposures.

And with respect to such tests, we believe we could do no better than to quote from remarks made by Dr. Charles F. Kettering in the course of his address before the Detroit Branch of the American Electroplaters Society when he said, and I quote,

"The same thing that spoils paint spoils plating. If you have little holes in your plating, you can spray a hose or salt spray on it all you want to and it isn't going to have any effect on it but if you wet that plating or surface with dew, you will wet it from the bottom up since the moisture enters as vapor, condenses, and fills the crack. This destroys the finish. Despite all the big thick books that have been written, all that is needed to ruin the finish is to alternately heat and cool the surface in a normal atmosphere and thus cause moisture to condense and evaporate on the surface.

These are just the fleas that bother us all the time. We must

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never lose sight of the fact that there are a lot of new things that are going to happen and all of them are in the years ahead.*

Now it becomes increasingly important for us to know just at what stage in the finishing cycle these tests are made. Are the panels set out for test as they come from the plating solution; are they set out after being barrel finished after the plating operation, or are they polished or buffed prior to being set up for corrosion resistance test. One can easily see that there very well may be a wide variation in the result of such tests, depending solely upon in what stage of the finishing procedure the tests were made. Quite obviously, the only fair test that can be made is to set up three panels for each specimen, as follows:

1. The plate just as it comes from the plating operation.
2. An identical plate to the above but appropriately barrel finished.
3. An identical plate to the above but polished and buffed.

We believe as a check plate, there should be still a fourth plate which, after plating, would be first appropriately barrel finished to harden the surface for resistance to wear. In this hardening or cold working operation, the pores would be closed for resistance to corrosion. The check plate should then be polished and buffed exactly the same as plate No. 3. From an experience of upwards of thirty years in the study of barrel finishing we would be satisfied to rest our entire case on the results as shown on plates No. 2 and No. 4, with the stress on plate No. 2, and we are amply satisfied that such a test would demonstrate that the elimination of the porosity that makes corrosion of the base metal possible will be brought back from the "years ahead" that Dr. Kettering speaks of, and right down to present day practical results.

All of the foregoing is, of course, preliminary and a setting of the stage, so to speak, for the discussion of the subject of barrel finishing vs. polishing and buffing.

Now, no one, and least of all the author of this series, has ever contended that a purely inanimate operation such as the mass production of parts for finishing by barreling, would equal **in all respects** a polishing or buffing operation where the parts are handled one at a time by an operator who can search out a dull spot here and another there and correct them very often with just a touch of the wheel. That little phrase which we have underscored "in all respects" is the rock on which just about every barrel manufacturer in existence has foundered at one time or another.

Not only the polisher as an operator but the majority of barrel manufacturers have gone along from year to year under the mistaken idea that merely the superficial or polished surface was the one big thing in any barreling operation, and that once a polish was obtained, the job was considered as final and complete. To such a contention we would never agree, because even though a polish is a nice thing to have, it is definitely not the important thing to gain from a barreling operation. That important thing is what we have so often stated it to be—the processing of parts in an adequate barrel with a **sufficient load of steel burnishing material to provide the necessary pressure** to cold work the surface, causing the metal to flow and close the

*C. F. Kettering, Monthly Review, American Electroplaters Society, January, 1941 page 22.

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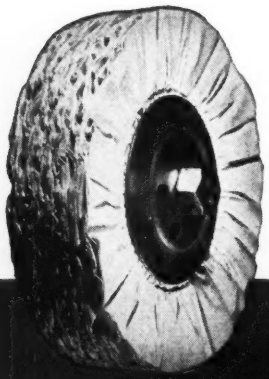

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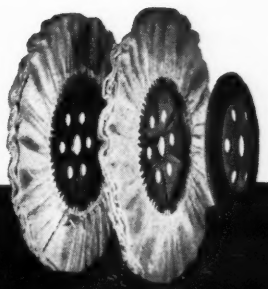

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pores and as an incidental and accompanying operation to harden the surface for resistance to wear.

These essential factors cannot be gained by the use of what we choose to call a "play toy" type or size of barrel, because few of these exert the pressure necessary to accomplish these major objectives. It is true, of course, that almost any sort of barrel if operated long enough will produce a polished or burnished surface on a metal part, but will it do any more than that? If it requires a pressure of let us say 800 pounds of burnishing material weight to compress or cold work the surface to close the pores, and a pressure of only 400 pounds is available, it is possible that the pores might be reduced somewhat in size, but not closed, so that the operation with the inadequate load would be futile.

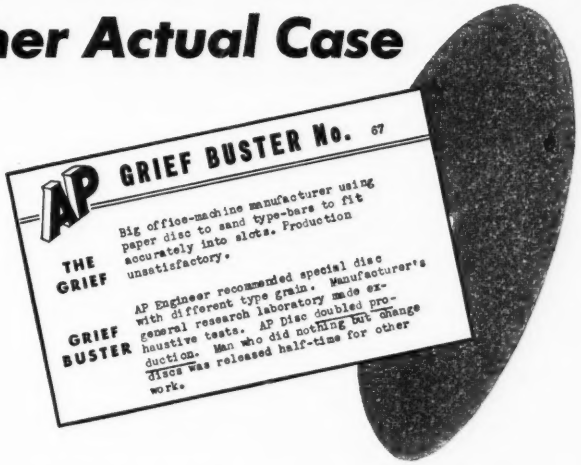
When some people speak of pores in a plated surface, it is seemingly with the thought that they should be plainly seen with the naked eye, or perhaps large enough that one could poke the point of a lead pencil into them without difficulty, but unfortunately this is not so, for if it were true then something would have been done about it long ago. So long as electrochemistry is unable to solve this problem of porosity of coated surfaces, and if barrel finishing procedure is effective, then such barrel finishing procedure must be seriously considered by every manufacturer of plated parts who wishes to present to his customers a product of which he can truthfully say that it is resistant to corrosion and wear to the greatest degree obtainable by present day methods.

Now if corrosion resistance and resistance to wear are the really important factors, and the brilliant surface finish, while desirable, is more or less a matter of customer or sales appeal, both of these factors may be accomplished in a joint operation first of which would be the barreling operation to close the pores and harden the surface and the second operation would be simply one of coloring the surface on a buff with a very soft polishing composition. Such a program would give us the essential factors of safety of the base material from corrosion and at the same time would enable that little personal and intimate touch to the lustrous finish that barreling operations alone in so many cases cannot provide.

Such a procedure does not mean any "upping" of costs due to the fact that the parts pass through a barreling operation. We have asked one polisher after another what he thought of such a plan, and we have yet to find the first one who would say that he preferred to both cut and color to just the color operation. As one polisher stated it to us: "I can do three times the volume of parts per hour, because about all they require is the wind off the wheel, and even though the rate is less, I can make more when I only have to color with lime finish." Indeed on parts that have been barrel finished prior to color buffing, the only operation necessary is what some polishers would better understand if it were expressed as simply "feathering off" on the wheel.

In its altogether practical aspects let us suppose a part is plated with 0.0002 in. of metal. Just how much of this would be removed in a polishing and coloring operation? Suppose it were plated to 0.002 in. of metal. If in the processes of polishing and buffing or coloring, 0.001 in. of metal were to be removed in an effort to obtain a smooth polished surface, there is no assurance that the pores will be

Another Actual Case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closed or the metal hardened. Two plates of steel were plated with silver at the same time and to the same thickness.

One plate was taken from the plating solution and barrel burnished for twenty minutes with a load of 480 pounds of steel burnishing material. A reading set with Hirth Minimeter before and after the burnishing operation showed that, on practically every part of the area checked, the reduction was about .00015 in. This plate showed negative to all average corrosion tests.

On the other plate the barrel burnishing operation was omitted, the plate being buffed with a composition 325 fine. On checking this plate on various parts of the surface, no two readings could be obtained that were identical. At some places surface removal showed around 0.000025 in. and in others as much as 0.0003 in., and in one spot the arrow dropped a full 0.0005 in. or pretty close to the base metal itself. Under the same corrosion tests, the reaction was almost immediately positive. To the naked eye, the pieces looked very much the same. Both had a highly polished surface, but on magnification the difference in the character of the surfaces became immediately apparent.

Now most manufacturers who do not have barrel finishing equipment would be inclined to say that it would hardly pay them to install equipment to learn whether this would carry true in their case, and in this we are inclined to agree. But it is not at all necessary for any interested manufacturer who seriously wishes to improve the corrosion and wear resistance values of his product to install any equipment until he first makes sure that it will do everything claimed for it.

He can plate a series of parts, send them out to be appropriately barrel burnished following which some can be checked for resistance to corrosion and wear as is, others can be color-buffed for higher lustre surface values and these in turn also tested for corrosion and wear resistance, and only after such tests are made will it be necessary for him to come to a decision as to whether the installation of the necessary equipment to duplicate the effort should be made in his own plant.

Of course, there are many manufacturers whose lines in a competitive market do not permit too much thought to permanency and for such this comment perhaps is not so applicable, but to the wide line of manufacturers of products who are honestly seeking some means toward greater permanency and stability of their plated surfaces, these suggestions should be decidedly pertinent.

"Some Observations of the Potentials of Metals and Alloys in Sea Water" and "Controlling Factors of Galvanic Corrosion" form the content of an authorized reprint from the copyrighted proceedings of the American Society for Testing Materials which is now being distributed through the courtesy of The International Nickel Company, Inc., 67 Wall St., New York City.

The first section of this very interesting 36-page book describes results of tests conducted by The International Nickel Company, Inc., at Wilmington, N. C., on the effect of sea water on various metals and alloys. This section was written by F. L. LaQue and G. L. Cox.

The second section is a technical discussion of tests conducted on iron coupled with copper in a neutral sodium chloride solution. This section was written by W. A. Wesley.

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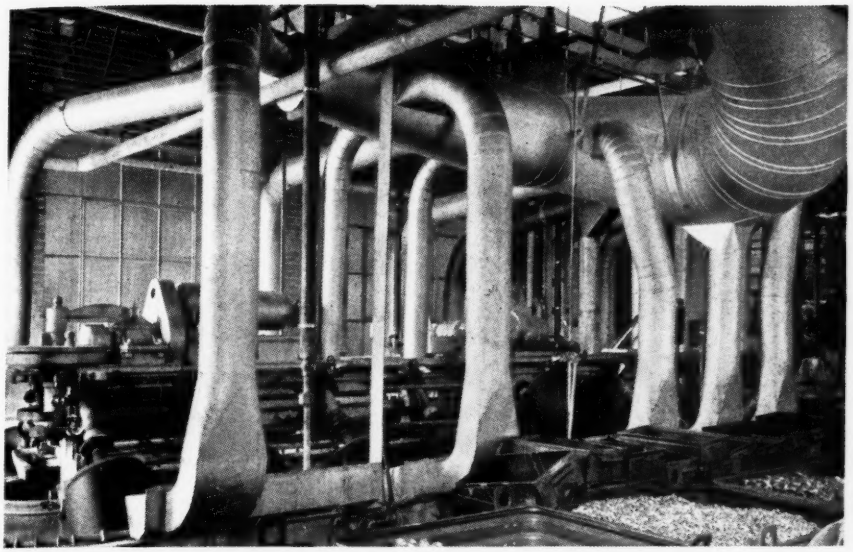

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DUST AND FUME CONTROL

Measurement of Paint Film Thickness

A Film Thickness Meter for the Measurement of Paint Thickness or the Thickness of Any Non-Conducting Coating on a Metal Base is Described Herewith

By ROBERT E. WHEELER
General Research Laboratory
Underwood Elliott Fisher Co.

THE meter to be described in this article is a definite improvement on a device which appeared in the November, 1938, issue of Products Finishing. The meter previously described had several fauts, which, unless extreme care was used, led to error. The meter could be read accurately only to .001", it was difficult to maintain a uniform pressure between the penetrator and the test panel, and it was very hard to be sure that the needle was at right angles to the surface being measured. The present device has been changed almost completely from a mechanical point of view, but the electrical circuit remains practically the same. The present design has overcome the difficulties encountered previously.

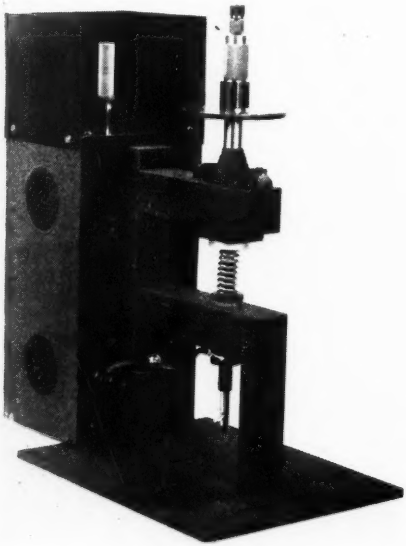

Fig. 1—Illustration showing paint film thickness meter.

Most film thickness meters on the market are either of the magnetic type, or of the type which requires considerable current to establish contact between the base metal and the penetrator. The magnetic type possesses many excellent features, but it is too complicated and costly for individual construction. The second type, while simple and inexpensive to construct, is inaccurate due to the shorting of the high current through a thin layer of the film, thereby giving low results. The meter to be taken up here has been in use for

some time in this laboratory, was relatively simple and inexpensive to construct, and due to its inherent characteristics has proved to be very accurate.

Fig. 1 gives a general idea of the appearance of the completely assembled meter. Fig. 2 shows the home-made dial which enables the micrometer to be read in ten-thousandths of an inch. Fig. 3 is a view of the meter torn down to show the composite parts which are used in its construction. Fig. 4 shows the electrical circuit which is used.

In order to measure the thickness of a paint film on a metal panel, the plunger in Fig. 1 is pulled down far enough to allow the panel to be interposed between the top of the plunger and the bakelite block through which the micrometer needle passes. The panel must either be bare on the underside, so that it can make electrical contact with the plunger, or it must be connected to it by means of a wire and clips. The plunger is then released and the spring holds the panel flush against the bakelite block. The micrometer screw is turned until the indicating light appears in the lucite rod at the top rear of the instrument. The film thickness is read directly in ten-thousandths of an inch on the dial. The micrometer can be calibrated, before inserting the panel, by merely turning the micrometer screw until the needle makes contact with the surface of the plunger, as shown by the indicator light; the dial can then be set to zero.

The micrometer used is an ordinary depth micrometer reading to .001 in. The end of the depth rod is drilled and split to accommodate a phonograph needle. The dial, shown in Fig. 2, is a steel disc about two inches in diameter and with the circumference divided into 250 equal division, thereby giving a 10:1 ratio which increases the sensitivity of the micrometer to .0001 in. The dial hub

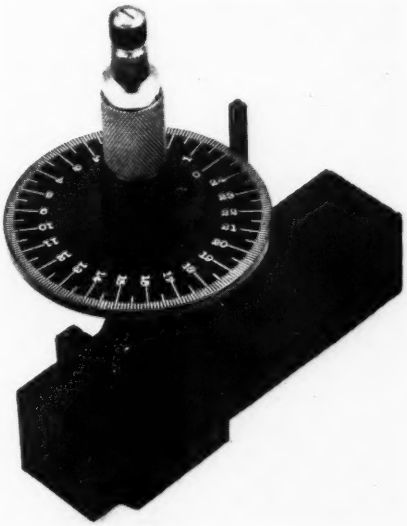

Fig. 2—Dial for paint film thickness meter.

is split so that it forms a slip fit on the micrometer shaft, thus enabling it to be set to zero before a reading is taken. Possibly, some sort of radio dial could be found which would serve the purpose, as any dial with 250 divisions around its circumference will be satisfactory. In order to facilitate the reading of the dial it was given a black plate and the graduations were filled with white. The micrometer is strapped to the inch square steel arm which is drilled to allow the passage of the needle through it and the bakelite block which is fastened to the opposite side of the arm.

Fig. 3 requires a somewhat detailed description. Referring to the numbers which appear on the photograph: No. 1 is the cover for the

power unit which is shown as No. 10. No. 2 is a black shield which goes around the indicator rod shown as No. 3. No. 4 is the plunger which holds the panel firmly. This is made of hardened and chrome plated drill

shown in Fig. 4. A 605 tube is employed in this instance although any tube of similar characteristics could be used. The relay is of the sensitive type and requires no more than 3 mils current to operate. When the

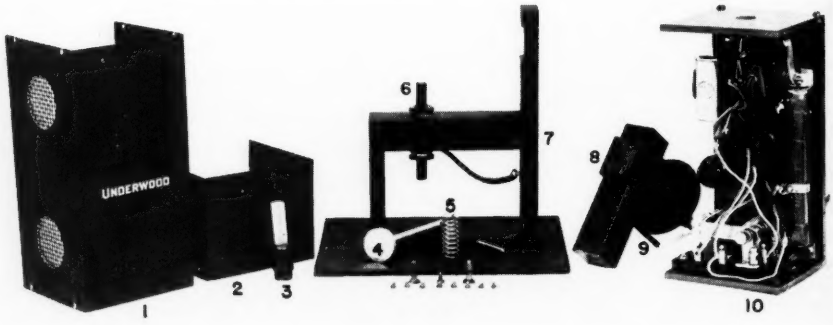

Fig. 3—Paint film thickness meter disassembled to show component parts.

rod, to resist any impression by the needle. It is controlled by spring No. 5 which exerts an upward force of between 7 and 10 lbs., which is sufficient to hold the panel while testing. No. 6 is the insulated bushing through which the plunger passes. This must be insulated from the frame of the meter and the micrometer. It is connected, by the wire shown, to its proper terminal in Fig. 4. No. 7 shows the rigid construction of the frame to insure perfect alignment between the plunger and the micrometer needle. No. 8 is a bottom view of the micrometer and its mounting showing the bakelite insulating block with the needle in the center. No. 9 is a bottom view of the dial and pointer shown in Fig. 2. No. 10 shows to 605 tube, relay, indicator lamp, and the various resistors, condensers, and so on, which go to make up the power unit.

The complete wiring diagram is

needle is not in contact with the plunger, that is, when the contacts marked "plunger" and "needle and frame" are open, no current flows through the relay coil, but the instant the penetrator makes contact with the test panel or plunger, current flows through the relay coil, thereby closing the contacts and lighting the indicator lamp. The sliding contacts on the large resistor, No. 1 across the 110 volt line should be so adjusted that the relay will just operate, that is, so that it will require practically a short circuit between the needle and plunger to operate the indicator. With the resistor adjusted in this manner, the plate circuit should not draw more than 3 mils on short circuit. The condenser across the relay coil is to prevent any objectionable sparking at the contacts.

Numerous variations in design could be employed very advantage-

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ously with this tester to fit in with particular problems. However, the advantages claimed for this meter

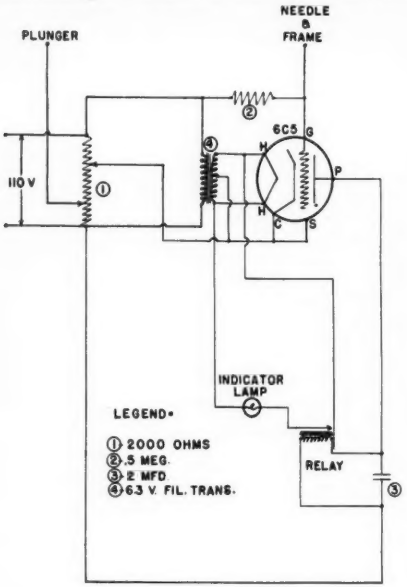

Fig. 4—Wiring Diagram for Film Thickness Meter.

should be borne in mind and be carried out in the redesign. These advantages are listed below:

1. Accuracy and reproducibility of results.
2. A means of obtaining a uniform pressure on the test panel for all measurements.
3. Ability to measure very thin films.
4. As small a current as possible should be allowed to flow between the penetrator and panel.
5. Rigid construction to allow for perfect alignment of the measuring components.

ACKNOWLEDGEMENT

Appreciation is expressed to the Underwood Elliott Fisher Company for permission to publish this work.

"Driers and Drying," by E. F. Bennett, and published by Chemical Publishing Company, Inc., 148 Lafayette St., New York City, is a particularly complete compilation of information on drying oils, the fundamental principles of the drying phenomenon, and the influence of metallic driers thereon, as worked out through many years by many investigators all over the world.

This book is a step towards a fuller understanding of the mechanism of the drying process and an addition to our knowledge of the subject. The work of the extremely capable investigators, through different methods of attack, have established the fundamentals of this complex phenomenon and their work is included in this book. Their work involved research in organic, inorganic, physical and colloid chemistry.

Dr. William Krumbhaar writes: "The present volume is a valuable contribution as it provides a better insight into the reactions which are connected with film formation, enabling the paint chemist to conduct and modify intelligently manufacturing procedures."

The literature on this subject is scattered in a very large number of scientific journals, many of them of foreign origin, and not readily obtainable in all cases.

The 106 references cited in this review provide an illustration of the difficulty commonly experienced. This book, therefore, represents an attempt to collect and collate the existing work on the subject of driers and drying and to present a picture of the information published up to the present time as a whole.

Contents of the book include: Introduction: oil types, drying, oxidation, induction period, antioxidants; Oxidation: mechanism, peroxides, polymerisation, volatile products, chemical changes, physical changes, functionally; Film Structure: physical basis, molecular types, orientation, tackiness and blooming; Driers: relative efficiency, cobalt, manganese, lead, pigment dispersion, mixtures of drieds, activation, non-metallic radical, precipitation, stability; The Constitution of Varnishes: polmerisation, resins, solvents, evaporation rate, solvent power, turpentine, white spirit, naphtha, skinning, antioxidants; The Influence of Pigments: oxidation, removal of drier, structural changes, reaction with vehicle, classification.

A copy of "Driers and Drying" can be obtained by sending $1.75 to Chemical Publishing Company, Inc.

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Gas Fuel for Short-Cycle Curing of Industrial Finishes

The following is an abstract of a report sponsored by the Committee on Industrial Gas Research

By CARL P. MANN
The Selas Company
Philadelphia, Pennsylvania

IT should be of particular interest to this group to know that the facts to be presented in this paper are the result of exhaustive studies initiated and sponsored by the Committee on Industrial Gas Research of the American Gas Association . . . . . It will be a source of great satisfaction to all of you to know that the results of this research project clearly demonstrate that gas fuel possesses unusual advantages . . . . . for the short cycle curing of industrial finishes.

However, it is not sufficient to know that gas fuel possesses these advantages. It is equally important that the characteristics of these finishes be known and the effects of various methods of heat application be thoroughly understood in order to combat false propaganda and to prevent inaccurate impressions being disseminated by those having but a superficial knowledge of the subject; as well as to guide all in the proper scientific design of equipment for each individual installation. Of course within the scope of this paper only the condensed highlights of the extended and thorough investigation can be outlined.

Bob Ahrensdorf, Products Finishing Eastern Representative, Interviewing Carl P. Mann of The Selas Company.

The facts presented in this paper apply only to polymerizing finishes, as oxidizing and volatilizing finishes are not suited to short cycle curing. By short cycle we refer to curing times of less than 30 minutes. The one fundamental fact developed in this investigation, and the cardinal point to be kept in mind in all consideration of curing finishes, is that the during of a finish is directly dependent on heating the workpiece, and only in the degree that any curing process accomplishes this, will

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that process be successful. It is certain that the paramount importance of this proven fact will not be overlooked by the members of this group, because immediately all problems of curing of finishes are stripped of the mystery and near mysticism . . . . . .

Gas fuel may be applied in the form of convection heating, infra-red ray radiant heating, or by a combination of both, and the selection of the proper application to be used in any particular instance can be made only when its specific requirements have been analyzed in the light of the known advantages and limitations of each method of applying gas fuel.

As these advantages and limitations will be discussed in relation to the characteristics of the workpieces, we will first examine the forms of these pieces. Are they regular or irregular in shape? Are they large or small? Is the surface polished or rough? Are the pieces thin or are they thick? Are there a variety of colors in the finishes or are they all one color? Taking these factors in order, we will examine how each affect the proper selection of heat application, and while we are primarily interested in the application of gas fuel alone, yet it will be very desirable to make incidental comparisons with other energy sources.

Irregularity of shape has no influence on convection heating, but in radiant heating it is important that no part of the workpieces cast a shadow over a finished part. Shadows inhibit the heating of the workpiece at that point, and consequently retard the curing process while the unshadowed parts of the workpiece cure normally. It is of equal importance that the rays strike all finished surfaces at approximately the same distance from the radiant source as the effectiveness of infra-red rays is very much influenced by the distance between the workpiece and the energy source. For instance, increasing this distance between the energy source and the workpiece from 6 in. to 10 in. increases the curing time for 150 per cent to 150 per cent depending on the kind of finish being used.

If the workpieces under consideration are large and regular in shape, and all pieces are the same, then radiant sources may be located to give uniform curing of the finish, but if the pieces are small, and if many must be grouped in the oven at the same time, it may be impossible to arrange the radiant sources to give uniform curing.

In this connection it is desirable to point out that if radiant sources are located beneath the workpiece in order to minimize the shadow effect, their effectiveness may be decreased due to dripping. . . . .

Polished or unpolished metal surfaces under finishes do not affect curing time with convection heating, but in the case of radiant heating a polished surface will require approximately 20 per cent more time for curing than an unpolished surface, if radiant gas burners are used, and if infra-red ray lamps are used the increase in curing time may vary from 9 per cent to 45 per cent depending on the type and color of finish.

Having in mind the fact that basically, curing of a finish is directly dependent upon increasing the temperature of the workpiece, it is obvious that the thicker the piece the longer will be the curing time. Irrespective of the method of curing, the longer the curing time for any shaped piece, the less will be the percentage increase in curing time due to an increase in the thickness of the piece. For instance, in radiant heating where there will be a 55 per cent

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increase in time due to doubling the thickness of a piece which has a curing time of approximately three minutes, there will be only a 36 per cent increase in time due to doubling the thickness of a piece which has a curing time of approximately eight minutes. In convection heating, where there will be a 35 per cent increase in time due to doubling the thickness of a piece which has a curing time of about ½ minute, there will be only an 8 per cent increase in time due to doubling the thickness of a piece which has a curing time of about 6½ minutes.

The color of a finish has no effect whatever in the curing time of a piece where convection heating is used, but one of the outstanding characteristics of radiant heating is the fact that, other things being equal, different colors of finishes require different curing times. Black will require the shortest curing time, and white the longest curing time, while other colors require intermediate time periods for curing. . . . . .

It is natural to draw the conclusion that increasing the amount of heating energy supplied by any method of curing will decrease the curing time. With the convection or radiant gas burner methods of heating, the percentage decrease in curing time is much greater. . . . . The explanation for this lies in the fact that the heating up rate of the workpiece increases much more with the increase in temperature of convection or radiant gas burner heating. . . . . .

Up to this point we have confined our discussion to the physical aspects of workpieces and how these affect the selection of the curing method to be used, and as stated above, the importance of these considerations must not be overlooked in solving the problem of curing finishes, but the final selection of any curing method will depend equally on the economic consideration of the problem, i.e., the cost of the necessary equipment for curing, the rate of production for any given space (or conversely the space required to produce the required number of pieces at a given rate) and finally the operating costs of the methods under consideration. Too often hasty conclusions are drawn based on superficial facts. Frequently decisions must be made rapidly, and in times like the present, under the stress of great pressure, so it is advisable that the most pertinent points of a problem be first selected, and the problem analyzed and clearly presented as viewed from these points.

The actual cost of equipment for any proposed installation must be estimated when the requirements of the design, character of workpieces, and necessary safety precautions are known. Any specific statement making a direct comparison between the costs of the several methods of curing would be misleading, ...

In the matter of design due consideration must be given to the fact that convection heating installations require from 15 to 30 minutes heating-up time before being ready for operation, ... and radiant gas burner installations almost immediately upon starting. Then, due to the rapidity with which convection heating acts on the finish it is necessary to provide for a one minute preheat period in the design of the oven. This can be advantageously accomplished by the exchange of heat from the cured pieces at the discharge end to the entering pieces at the feed end. This eliminates any additional heat for preheating, prevents accumulation of solvents, and cools the cured workpieces, a desirable feature as it facilitates handling for inspection

and otherwise. Any curing installation should provide for this, but the figures included in this presentation have not included the necessary power for providing the cooling in circulation.

It may well be pointed out here that the only way of utilizing exclusively the infra-red rays from a radiant gas burner is to interpose a glass barrier between the workpiece and the burners, as was done in the series of tests on which this presentation is based. This is, of course, undesirable, in most cases impractical, and furthermore unncessary, because by the elimination of the glass barrier we obtain a method of curing which combines both radiant and convection heating which leads to a most advantageous curing method. . . . . .

Confirming our earlier statement on this subject, it is clear that the data developed in this presentation definitely point toward a combination of radiant heating of gas burners with convection heating. By circulating the products of combustion given off by the rediant burners within the oven, we add the curing effect of this circulated air to the unshielded radiant heat from the burners themselves, which combination would point toward a very compact and efficient curing installation. . . . .

Rincontrol Wrinkle Finish. The Roxalin Flexible Lacquer Co., Inc., Box 713, Elizabeth, N. J., is now issuing a four-page bulletin describing a wrinkle finish known as Rincontrol. This 8½ by 11 bulletin includes a sample finished panel and illustrates and describes eight Rincontrol features. In addition, several outstanding products on which this textured enamel finish is used are shown. Copy free upon request.

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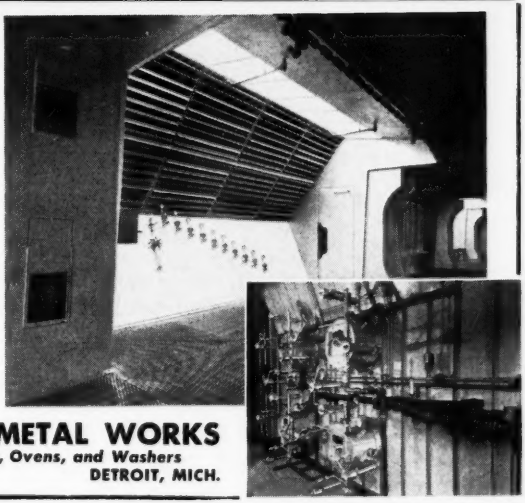

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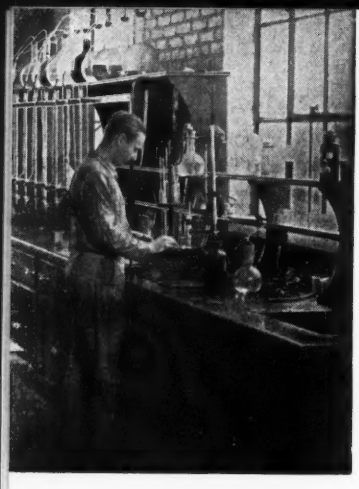

Practical Applications of MODERN Equipment

Maintenance of Hand Fire Extinguishers

FIRE extinguishers, to be instantly available for use at all times in the finishing department, must be properly recharged and inspected. The date of recharging should be nited on the tag provided for that purpose, along with the name or initials of the man doing the work.

Fire insurance underwriters recommend that only recharging materials and replacement parts furnished by the manufacturers of the extinguishers be used in service work. Full instructions for recharging the various types of extinguishers are given on the labels and they should be followed to the letter.

When the 2½-gallon units are recharged, all parts should be washed thoroughly in water and the water drained through the hose. The shell should be examined to make certain it is sound at the seams, for, after all, it is a pressure container. The head gasket and hose should be examined for signs of deterioration, and the strainer should be cleaned.

When the cap is screwed back on the shell, the worker should make certain that at least four threads are engaged. A small amout of vaseline may be placed in the threads to make the task easier and facilitate removal for the next recharging.

All chemical solutions should be mixed in clean containers and not in the shell of the extinguishers, and the container should be carefully rinsed before being used for a new solution.

Only liquid obtained from the manufacturer should be used in the vaporizing liquid type extinguisher. The use of commercial carbon tetrachloride, which may contain some water or chemical impurities, is likely to damage the interior of the extinguisher, or if used on live electrical equipment, endanger the operator.

Directions for Inspecting and Recharging Extinguishers

Soda-acid:

Recharge annually. If exposed to temperatures below 40 degrees F., place in suitably heated cabinets. Do not mix anti-freeze crystals with the solution.

Foam:

Recharge annually. Anti-freeze in-

gredients should not be added to the solution and if exposed to temperatures below 40 degrees, extinguishers of this type should be kept in suitably heated cabinets.

Vaporizing Liquid:

Recharge after use and keep unit filled at all times. Test action of pump by discharging a portion of the liquid into a clean, dry container. The test liquid can be poured back through the filler opening. Guard against overfilling. No lubricants should be used on the piston of this type of extinguisher, nor should any water be placed in it.

Loaded stream:

Recharge after use; inspect annually to see if container is filled and that hose and gasket are in good condition. Weigh carbon dioxide cylinder and replace it if it has lost one-half ounce. Extinguishers of this type may be exposed to temperatures as low as 40 degrees below zero F.

Carbon dioxide:

Recharge after use; inspect annually to note if seal is intact. Weigh the unit to make certain weight is equal to that stamped on it. Loss of ten per cent in weight indicates the need for recharging.

Anti-freeze, pump tank:

Recharge after use; inspect annually to make certain it is filled to filling mark. Test pump action by operating pump for several strokes, directing the stream back into the tank.

Anti-freeze, other types:

Recharge after use; inspect annually to see if container is filled and that hose, gasket, etc., are in good condition. If carbon dioxide is used for pressure, loss of one-half ounce in the weight of the cylinder is cause for replacing it with a new one.

The information contained in this article was supplied through the courtesy of Safety Research Institute, 420 Lexington Avenue, New York, New York.

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WARNING NOTICE. Manufacturers of buffs are warned against infringement of the claims of this U. S. Patent 2,004,623, as the owner intends to protect his right and prevent all infringement.

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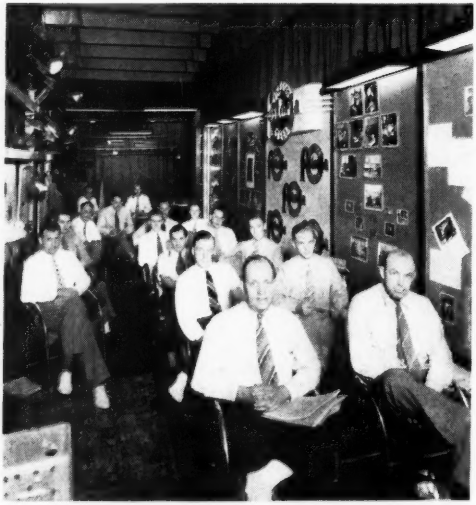
News OF THE INDUSTRY

Fostoria Establishes Near Infra-Red Institute

An educational program designed to acquaint users of infra-red equipment with the proper operating technique of such equipment is now being offered in the form of a "Near Infra-Red Institute."

Located at The Fostoria Pressed Steel Corporation plant, Fostoria, Ohio, the institute is said to provide an opportunity for representatives of paint and enamel manufacturers, conveyor makers, central station power salesmen, and similar individuals to study near infra-red at first hand.

Classes are held on the third Tuesday and Wednesday of each month. No charge is involved. The subject is discussed informally in the classes and considerable time is spent in the Fostoria near infra-red testing laboratory where actual applications of the process are studied. Instruction is given in both the theory and the practice of infra-red application.



Lecture Meeting of Fostoria Near Infra-Red Institute

Porcelain Enamel Institute Tenth Annual Meeting

The Porcelain Enamel Institute, 612 N. Michigan Ave., Chicago, Ill., will hold its tenth annual meeting at French Lick Springs Hotel, French Lick, Ind., April 17 and 18, 1941. The date of this meeting was established by the Board of Trustees for April so that everyone in the industry would have an opportunity to enjoy two days at this beautiful spot in Southern Indiana while transacting the necessary business. Every arrangement is being made to include the maximum amount of time for recreation as well as a complete program such as has always been presented at these meetings.

The rapid changes which are being made in all American business today make it necessary for those interested in the porcelain enameling industry to study carefully the effect of the national defense program. Colonel Murphy, Procurement Planning Officer, Quartermaster Depot, will give some valuable advice on contact with this branch of the Army. Others, equally important in this field, will discuss pertinent topics.

Closing the program on Friday evening at a dinner, Strickland Gillilan, nationally known humorist, will present his ideas of Washington personalities. Mr. Gillilan has been known for years as one of the best commentators on Washington politics and yet one who can give his information in a rollicking humor which is greatly enjoyed by his listeners. He will come directly from Washington for this meeting.

As French Lick Springs Hotel is operated on the American plan, there will be no necessity of special charges for luncheons or dinners. The hotel rate will include everything which has usually been provided at Porcelain Enamel Institue meetings of this kind.

The officers extend a cordial invitation to the executives of all porcelain enameling companies and suppliers of materials to be present at these meetings.

Castor Oil as New Paint Ingredient

Castor oil, the quick growing chemurgic crop once used only for medicinal and lubricating purposes, is now being adopted in greatly increased quantities by the paint industry to replace drying oils supplied by countries now at war or embargoed, according to a paper delivered by Dr. John C. Weaver, of The Sherwin-Williams Company, 101 N. W. Prospect Ave., Cleveland, Ohio, at the Mid-American Chemurgic.

The problems of the paint chemist in developing oils to replace those formerly imported from abroad were described by Dr. Weaver, who said that a new process of dehydration makes an excellent drying oil from the product of the castor bean. He stated that the wars caught the paint industry in a bad position in that most farm-grown oils such as oiticia, perilla, and tung are either slow in development or not suited to the climatic conditions of continental United States, but that new castor

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2. Tough—withstands wear and tear of handling.
3. Contains no ingredients harmful to plating solutions.
4. Cuts costs—reduces frequency of recoatings.
5. Easy to apply—"dip and force dry" method.
6. Light in color—easy to see how well the rack is covered.
7. Any part of rack can be recoated without recoating entire rack.

Write for Bulletin No. 31
Containing Complete Information

Platers without rack-coating facilities may have their racks coated with "Unichrome"* Rack-Coating-W by Chromium Corporation of America, 4645 West Chicago Avenue, Chicago, Ill.; Belke Manufacturing Company, 947 North Cicero Avenue, Chicago, Ill.; or United Chromium, Inc., Waterbury, Conn.

UNITED CHROMIUM
INCORPORATED

51 East 42nd Street, New York, N.Y.
2751 E. Jefferson Ave., Detroit, Mich.
Waterbury, Conn.

*Trade Mark Reg. U.S. Pat. Off.

plantings can produce a good crop of beans in a single year. Already American farm-production of castor beans is twice the output of two years ago.

Walter Peckinpaugh Joins The Skybryte Company

Walter S. Peckinpaugh, son of Roger Peckinpaugh, now manager of the Cleveland Indians, has joined the Skybryte Company, 3125 Perkins Ave., Cleveland, Ohio, as sales representative for its line of maintenance paints and rust preventing products in that district.

Walter Peckinpaugh

Walter Peckinpaugh played three years on the University of Michigan baseball team and was captain in his senior year. He is a member of Phi Gamma Delta and the Michigamma Honorary Society.

Hanson-Van Winkle-Munning Company Adds to Staff

The Hanson - Van Winkle - Munning Company, Matawan, N. J., manufacturer of electroplating equipment and supplies, has made a number of additions to its staff. The sharp rise in the company's business has necessitated increased field representation to provide for the continuance of its customary service.

John E. Keyes, who has been transferred from the company headquarters in Matawan, N. J., has assumed his duties as a representative, located in the Detroit office at 2842 W. Grand Boulevard.

William J. Wise, who was for many years associated with the finishing department of the National Cash Register Company, has joined the Hanson-Van Winkle-Munning sales organization. Mr. Wise has opened a new office located at 601 Oxford Ave., Dayton, Ohio.

Mr. Robert M. Norton, former sales manager of the Western Union Telegraph Co., in New Jersey and Eastern Pennsylvania, has been assigned to work with H. A. Todd, representative of the company in Syracuse, N. Y., after a period of training in Matawan.

J. MacDonald Smith, for many years president of Kabushiki Kaisha A. P. Munning Co., of Kobe, Japan, has returned to the United States. He has rejoined the Hanson-Van Winkle-Munning Company as export manager with headquarters at the New York Office, 30 Church Street.

O. Waring Mellick, sales representative of the Hanson-Van Winkle-Munning Company, has been transferred from the main office, Matawan, N. J., to the Bridgeport, Conn., office at Fifth and Charlotte Streets.

John VanderVoort has been transferred from the duties of a direct sales representative in up state New York to special duties in the main office of the company at Matawan, New Jersey.

Bakelite Corporation Displays New Resins at Paint Show

The exhibit of the Bakelite Corporation, 30 East 42nd St., New York, N. Y. at the Paint Industries' Show which was recently held in connection with the annual meeting of the Southern States Federation Associates in the Roosevelt Hotel, New Orleans, La., featured several important new Bakelite resin development. The exhibit featured the new Bakelite C-9 resins which are based on a new raw material known as "Carbic" anhydride.

Another important feature of the exhibit was the Bakelite dispersion resins which were developed to provide "super-speed" coatings of maximum durability for aircraft; shop coats on steel, touch-up primers, specification finishes and traffic paints. The outstanding feature of these new coatings is said to be the fact that they will dry in seconds

and minutes as compared with hours and days for previous coatings.

A section of the display covered the latest findings on the use of American soft oils which were developed to meet the need arising from a shortage of China wood oil.

Despatch Increases Manufacturing Facilities

The Despatch Oven Company has announced an increase in the manufacturing facilities at its plant located at 622 S. E. Ninth St., Minneapolis, Minn. The manufacturing floor space of the plant has been increased 30 per cent, and additional machinery has been added so that production facilities have been tripled.

The increase in manufacturing facilities has been necessary because of the large volume of orders for ovens, heat treating furnaces, and for air heaters. Approximately 50 per cent of the present production is either directly or indirectly related to the National Defense Program. The additional facilities provided by increased manufacturing space are said to be assurance of prompt delivery to all purchasers of Despatch equipment.

Milwaukee Chapter, American Electroplaters' Society Annual Educational Session and Banquet

The annual educational session and banquet of the Milwaukee Chapter of the American Electroplaters' Society will be held Saturday, April 26, 1941, at the Schroeder Hotel, Milwaukee, Wis. The educational session will be held at 2 P. M. in the Green Room. Speakers for this meeting are as follows: R. F. McGuire, Donald Sales and Mfg. Co., "Rust Proofing with Cadmium;" Wm. C. Geissman, "The Chemical Engineer and Electroplating;" and Vincent Matacotti, Hanson-Van Winkle-Munning Co.

The banquet will be held at 7 P. M. in the Crystal Ballroom. Reservations at $3.00 each for this meeting can be obtained from Robert Steurnagel, 2370 North 32nd St., Milwaukee, Wisconsin.

Sherwin-Williams Elects Arthur W. Steudel President

The Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio, announces the election of Arthur W. Steu-

We make Filters for every purpose.

The Alsop Engineering Corp.

8 Bright St. • Milldale, Conn.

KEEP YOUR PLATING SOLUTIONS ALWAYS CLEAN WITH THE . .

ALSOP HY-SPEED FILTER EQUIPMENT

This small, compact and portable filter takes apart quickly, cleans easily and can be moved from tank to tank, to filter any number of different plating solutions. The Alsop method is new and revolutionary, the result of twenty years experience with plating problems. The complete story is told in a book. You should read it.

Write for your copy today, it's free!

del as president succeeding George A. Martin, who becomes chairman of the board, effective immediately. Both men have long records with the company and both have worked from humble beginnings to the top in the largest paint manufacturing organization in the world.

Mr. Steudel has been vice-president and general manager and now becomes the fourth president in the 74 years existence of the company. The new president at 48 is admirably fitted for his responsibilities, having served in various operating, selling, and administrative capacities in the paint, varnish, lacquer, chemical, and insecticide divisions of the company.

Solvents Recovery Opens New Plant

Solvents Recovery Service, Inc., Lister Ave. and Brown St., Newark, N. J., announces the opening of a new plant at Linden, N. J. This company is engaged in recovering solvents from dirty wash and lacquer thinners. The Lofgren Process is used to recover the solvents.

NOW...

S-310

RUST INHIBITIVE

Formulated specifically for the following properties:

1. Very fast air-drying
2. Water-whiteness
3. Tenacious adhesion
4. Hardness combined with flexibility

and

RUST RESISTANCE

S-310

is used and recommended as a clear coating for hand tools, machine tools, hardware and wherever a clear protective coat for bright metal is required.

The Varnish Products Co.
5208 Harvard Ave. Cleveland, Ohio

The plant at Linden, N. J., has been equipped with the latest type of recovery apparatus and will provide the facilities for handling a steadily increasing demand for solvent recovery service.

G. H. McIntyre Appointed Research Associate at National Bureau of Standardc

R. R. Danielson, Metal and Thermit Corporation, and vice president of the Porcelain Enamel Institute, announces the appointment of Dr. G. H. McIntyre, of the Ferro Enamel Corporation, as chairman of the Committee on the Research Associate at the National Bureau of Standards. This committee supervises the work of Dr. Paul Smith, who has served as research associate for the Porcelain Enamel Institute for the past three years.

Dr. McIntyre's appointment as chairman of this committee was made at the Fifth Annual Forum recently held at the University of Illinois. He is director of research for the Ferro Enamel Corporation, Cleveland, Ohio, and, because of his long association with porcelain enameling, brings to this committee a fund of knowledge which will guide the research associate's work in perfecting standard tests for use by the various branches of the industry.

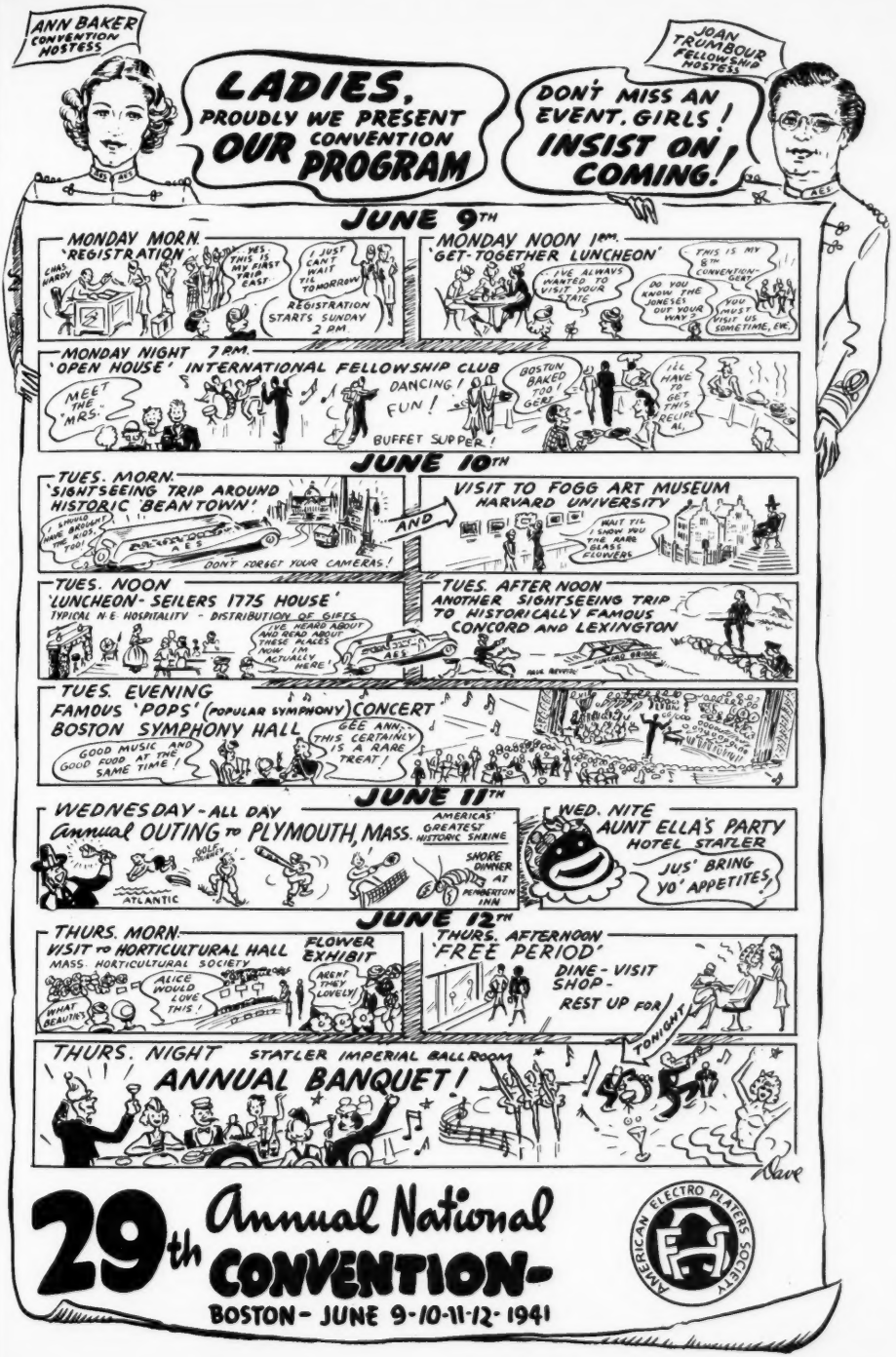
Dr. McIntyre is taking immediate steps to push forward this work in an aggressive manner.

Bender To Be In Charge of Sauereisen Cements Company Sales Department

Mr. W. F. Bender, formerly associated with the U. S. Rubber Company, has been appointed chief engineer in charge of engineering and sales of the Sauereisen Cements Company, Pittsburgh, Pa.

Mr. Bender has had many years of experience in the chemical and process industries supervising the construction and installation of acid tanks, rubber linings, anti-corrosion equipment and heat treating which should prove very valuable in the technical and industrial cement field.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.


ANN BAKER
CONVENTION HOSTESS
LADIES,
PROUDLY WE PRESENT
OUR CONVENTION PROGRAM
JOAN TRUMBOUR
FELLOWSHIP HOSTESS
DON'T MISS AN EVENT, GIRLS!
INSIST ON COMING!
JUNE 9TH
MONDAY MORN.
'REGISTRATION'
CHAS. HARDY
YES THIS IS MY FIRST TRIP EAST.
I JUST CAN'T WAIT 'TIL TOMORROW
REGISTRATION STARTS SUNDAY 2 PM.
MONDAY NOON 1PM.
'GET-TOGETHER LUNCHEON'
I'VE ALWAYS WANTED TO VISIT YOUR STATE
THIS IS MY 5TH CONVENTION-ETTE
DO YOU KNOW THE JONESES OUT YOUR WAY?
YOU MUST VISIT US SOMETIME, ETC.
MONDAY NIGHT 7 PM.
'OPEN HOUSE' INTERNATIONAL FELLOWSHIP CLUB
MEET THE 'MRS.'
DANCING!
FUN!
BUFFET SUPPER!
BOSTON BAKED TOO! GEE!
I'LL HAVE TO GET THIS RECIPE AL.
JUNE 10TH
TUES. MORN.
'SIGHTSEEING TRIP AROUND HISTORIC 'BEAN TOWN'
I SHOULD HAVE BROUGHT THE KIDS TOO!
DON'T FORGET YOUR CAMERAS!
AND
VISIT TO FOGG ART MUSEUM
HARVARD UNIVERSITY
WAIT 'TIL I SHOW YOU THE RARE GLASS FLOWERS
TUES. NOON
'LUNCHEON - SEILERS 1775 HOUSE'
TYPICAL N.E. HOSPITALITY - DISTRIBUTION OF GIFTS
I'VE HEARD ABOUT AND READ ABOUT THESE PLACES NOW I'M ACTUALLY HERE!
TUES. AFTER NOON
ANOTHER SIGHTSEEING TRIP TO HISTORICALLY FAMOUS CONCORD AND LEXINGTON
PAUL REVERE'S
TUES. EVENING
FAMOUS 'POPS' (POPULAR SYMPHONY) CONCERT
BOSTON SYMPHONY HALL
GOOD MUSIC AND GOOD FOOD AT THE SAME TIME!
GEE ANN, THIS CERTAINLY IS A RARE TREAT!
JUNE 11TH
WEDNESDAY - ALL DAY
ANNUAL OUTING TO PLYMOUTH, MASS.
ATLANTIC
AMERICAS' GREATEST HISTORIC SHRINE
SHORE DINNER AT PEMBERTON INN
WED. NITE
AUNT ELLA'S PARTY
HOTEL STATLER
JUS' BRING YO' APPETITES!
JUNE 12TH
THURS. MORN.
VISIT TO HORTICULTURAL HALL
MASS. HORTICULTURAL SOCIETY
FLOWER EXHIBIT
WHAT BEAUTIES
ALICE WOULD LOVE THIS!
AREN'T THEY LOVELY!
THURS. AFTERNOON
'FREE PERIOD'
DINE - VISIT SHOP -
REST UP FOR
TONIGHT
THURS. NIGHT
STATLER IMPERIAL BALL ROOM
ANNUAL BANQUET!
Dave
29th Annual National CONVENTION-
BOSTON - JUNE 9-10-11-12-1941
AMERICAN ELECTRO PLATERS SOCIETY

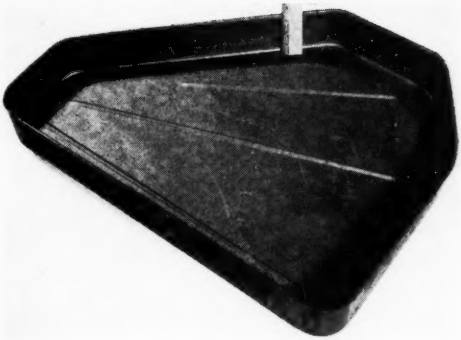
Finishes THAT AID IN APPEARANCE AND UTILITY

(Right) — Color to feature metal coffee containers. Red cans are for the regular grind, white designates drip grind, and blue cans distinguish the coffee for glass pot grind.

(Photo Courtesy Modern Packaging)

(Photo Courtesy Charles Bruning Co., Inc.)

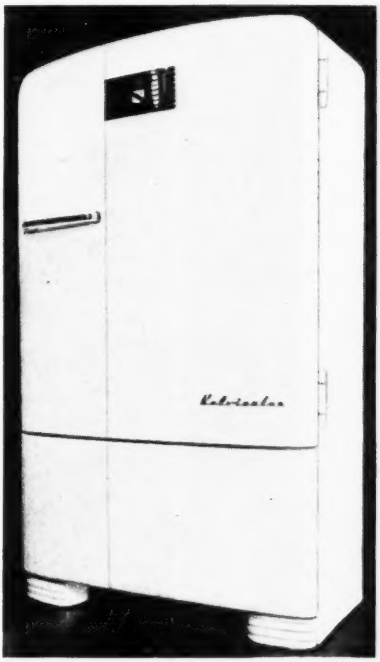
(Left)—The finish on this printing machine consists of a two-tone green. The central portion of the unit is dark green enamel wrinkle finish, sprayed and baked, and the remainder of the cabinet is finished in light green enamel, sprayed and baked.



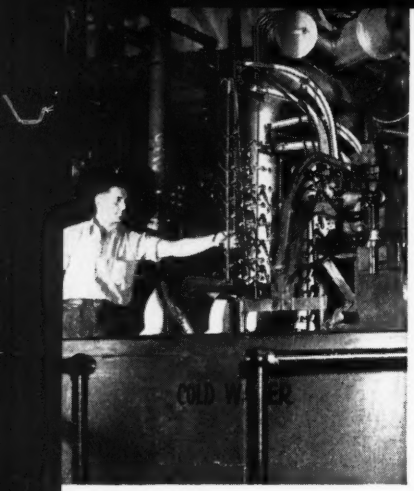
(Photo Courtesy American Rolling Mill Company)

(Left)—The high grade zinc coating on this fuel reservoir easily withstands a severe forming operation without peeling or flaking. A special Bonderized finish, united with the zinc coating in the steel mill, provides an excellent neutral surface for paint.

(Photo Courtesy Kelvinator Corporation)



(Right)—Gleaming white enamel finishes for refrigerators are enhanced when used with bright chromium trimming.



New PLANT EQUIPMENT AND Materials

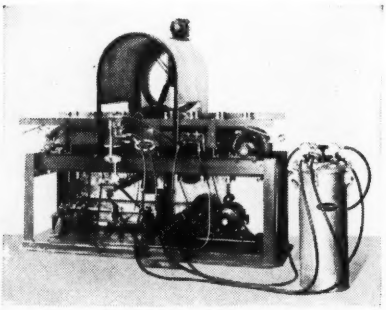
Eclipse Artillery Shell Sprayer

A fully automatic machine to spray coat the inside of projectiles has been built by the Eclipse Air Brush Co., Inc., 400 Park Ave., Newark, New Jersey.

The machine as illustrated sprays the inside of 155 mm. shells at the rate of 500 an hour, although this same type machine can be built to handle any size projectile or other cylindrical object.

The shells are picked up by metal arms from the conveyor belt, carried along in a horizontal position on the machine to a point in front of an automatic spray gun fitted with an extension nozzle. A master switch trips the trigger on the gun as it starts to move forward, and a rotating device, with which the gun is synchronized, spins the shell to insure an even coating. As soon as the nozzle has withdrawn from the projectile, the shell moves along, making room for the next one.

At the end of the machine the metal arms deposit the sprayed shell, still in a horizontal position, on another conveyor belt.



Eclipse Artillery Shell Sprayer

Grainlock Sizing Cement

Industrial Lubricants Co., Inc., 5736 12th St., Detroit, Mich., has placed on the market a Grainlock Sizing Cement for use on polishing wheels. Grainlock Sizing Cement was developed primarily for use with Grainlock polishing wheel cement, as a primer or base upon which to apply cement. The sizing is worked thoroughly into the wheel, first against the nap and then in the opposite direction.

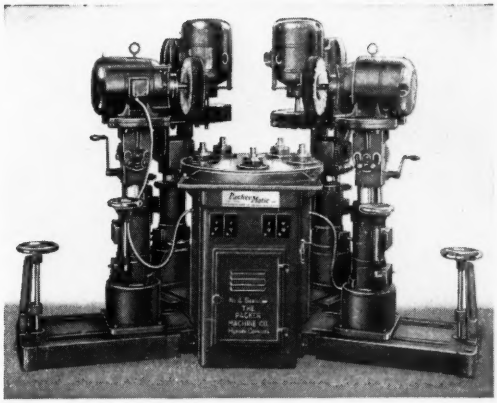
Grainlock Sizing Cement is said to form a fireproof coating that penetrates the cloth and thus reduces the danger of burned wheels to a minimum. It is also said to prevent "breaking-out" and glazing.

Research Model Taber Abraser

An efficient and accurate testing machine for evaluating resistance of surface finishes to rubbing abrasion to be known as the Research Model Taber Abraser is now being marketed by Taber Instrument Company, 113 Goundry St., North Tonawanda, N. Y. This machine can be used on surface finishes such as paints, lacquers, and electroplated coatings.

The primary elements of the abraser

ODD SHAPES ARE EASY, TOO!
on PACKER-MATIC



PACKER-MATIC No. 4 ROTARY TYPE complete with Automatic Composition Applicator, centralized control for economical operation.

Six faces and each must shine with brilliant sales appeal! On a PACKER-MATIC it's easy—automatically rotating on their own centers, volume parts such as these are Buffed with a mirror-like finish at an enormous saving in time and finishing cost. Hex. and octagon shaped parts are not the unusual on PACKER-MATIC—the Wheel Heads set at any degree plus the variable speed operation of the Work Table, make seemingly difficult Polishing and Buffing, a simple, regular job on a PACKER-MATIC.

There's a Type of PACKER-MATIC for Your Job — SEND PART and get a "Time Study"—WRITE Dept. TS

•AUTOMATIC POLISHING & BUFFING MACHINES

Packer-Matic

THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.

Research Model Taber Abraser

are a motor driven turntable on which the specimen is mounted, a counter to indicate the number of abrasion cycles, and two abrading wheels that alternately rub back and forth, and at the same time, crisscross in their rolling path. These wheels are made in five types of closely controlled resilient material which is charged with special grades of fine abrasive grain.

The Research Model Taber Abraser is provided with a standardized load adjustment for varying the pressure of the wheels against the specimen, depending upon the type of material being tested. For instance, the pivoted arms with the auxiliary weights provide a pressure up to 1000 grams which is the standard for finishes such as paint, lacquer, and metallic plating. In general, the wheel pressure selected should accelerate the test to the point where the duration of the result ranges from 500 to 5000 abrasion cycles.

Hanson-Van Winkle-Munning Stainless Steel Polishing Compounds

A line of rouges and other compounds for polishing stainless steel has been developed and is now being marketed by the Hanson-Van Winkle-Munning Company, Matawan, N. J. An outstanding constituent of these polishing compounds is said to be a special levigated alumina flour.

The development of these compounds is said to have resulted in the perfection of a variety of grades and numbers which are said to produce all of the finishes required in the manufacture of metal products—from rough ground to mirror finishes.

Yale & Towne Improved "Blue Streak" Hand Lift Truck

Improvement in the Yale & Towne "Blue Streak" Hand Lift Truck for

BLACK for Iron and Steel

Original, low temperature, patented method

One salt; one bath; one control; one operator. Protects and beautifies; lowers finishing costs; speeds production.

Ask for details. Sample JETALized free.

ALROSE CHEMICAL CO.
PROVIDENCE, R. I.

the JETAL process

? DEGREASING ALUMINUM ?
USE D'OILENE "X"
and Forget Your Trouble

Use D'Oilene "A" and D'Oilene "B" for ordinary work.

MECHANICAL PROCESS CO.
Specialists in handling chlorinated solvents
15 VALLEY STREET **SOUTH ORANGE, N. J.**

handling loads up to 2,500 lb. are announced by the manufacturer—The Yale & Towne Mfg. Co., Philadelphia Pa. Improvements are said to have been made not only with an eye to more attractive appearance but also to greater safety, lower maintenance, and higher efficiency.

Among the features of the improved Blue Streak is a new type of balanced tubular handle in which the comfortable fitting hand grip, tubular shaft, and lower handle casting are welded into a single unit to prevent parts from working loose. The handle balancing mechanism, which is designed to keep the handle in an upright position, prevent tripping, and relieve the operator of handle weight, is completely enclosed in the handle for protection from outside shock. Another improved Blue Streak feature is the shorter handle stroke required for lifting work.

A newly designed counterbalanced load-retaining hook, which eliminates the need for springs, grips or roller latch, thereby holding the load in positive lock while elevated. The roller latch in addition to eliminating wear also permits trigger action release of the load.

Yale & Towne Improved "Blue Streak" Hand Lift Truck

The lift hook of the Yale & Towne Blue Streak has also been improved.

BLAKESLEE MACHINES..

DO THE COMPLETE JOB . . . *and Quickly*

Metal Parts washers—Degreasing machines for the kind of production efficiency you must have to fill the defense orders coming up, the ones you now have in your plant on your regular production—large or small. Stampings, punchings, deep draws, machined castings, screw machine products—clean and dry in Blakeslee engineered-for-you metal washers and degreasers. Perfect cleaning before painting, assembly, plating, finishing and after quenching, machining, polishing, forming, etc. We have a thorough knowledge of your cleaning problems, a knowledge backed by actual experience. We will be pleased to make a survey and submit proposals without obligation on your part. **Write for free literature.**

★

G. S. BLAKESLEE & COMPANY

NEW YORK • CHICAGO • TORONTO, ONT.

Self-locking, the hook requires only the slightest pressure on the treadle to positively engage the lifting frame. When the load is fully lifted, the hook automatically disengages, providing a free handle and preventing "flying handle." By means of the handle, loads may be elevated at any point within a 90-deg. arc.

The improved Blue Streak lift truck features full 180-deg. steer, thus enabling it to be steered around sharp turns. The steering column operates inside a special steel bushing, and a hardened steel washer is inserted between the head casting and the wheel fork to minimize friction and provide easier steering.

The Yale & Towne Improved Blue Streak Hand Lift Truck retains the compound (articulating) lifting mechanism that changes the lifting ratio, flattens out the lift curve, and reduces lifting effort. Also retained are the keyed, high carbon, chrome-manganese, hardened steel axles, hydraulic release check that cushions descending loads, welded single-unit load frame with rounded safety corners, and heavy duty machine-turned wheels mounted on Hyatt roller bearings. The improved truck is made in two models, one having a wide frame and the other a narrow frame. Each model has a capacity of 2,500 pounds.

Textite Separator

A centrifugal separating unit for removing water, oil, dirt, scale or rust from compressed air, gas, or steam, to be known as the "Textite" Separator, has been placed on the market by Chicago Manufacturing & Distributing Co., 1928 W. 46th St., Chicago, Ill.

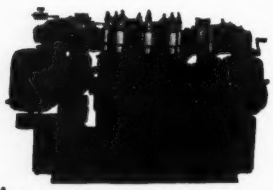
The Textite Separator is constructed of high grade cast aluminum. All parts are accurately machined and sychronized to control air action. This separator is said to provide an efficient and economical method of drying and cleaning compressed air. Three models are available. Model N has a capacity of 15 to 20 c.f.m. Model W has a capacity of 25 to 35 c.f.m. Model S has a capacity of 50 to 60 c.f.m.

Textite Separator

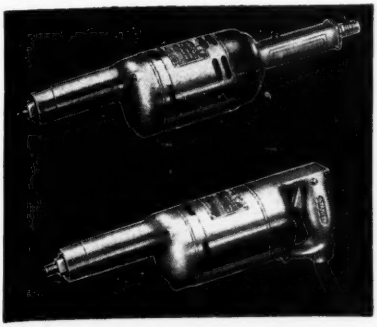
Stanley Portable Electric Polishers

The Stanley Electrical Tool Division, The Stanley Works, New Britain, Conn., has developed two portable electric polishers for the cleaning and polishing of metal and removal of stains

START THE JOB RIGHT!
Use
SOL KLEAN
On all types of metal prior to painting
INDUSTRIAL CHEMICAL PRODUCTS CO.
Detroit
Cleveland Fort Wayne


Send Sample for Free Production Estimate.
Step Up Production!
WITH "ACME"
Straight Line, Rotary or Semi-Automatic Polishing and Buffing Machines.
STEP DOWN Polishing and Buffing COSTS!
ACME MANUFACTURING CO. . . 1642 Howard St., Detroit, Mich.

or heat tint caused by welding. Designated as the Nos. 182 and 187, the polishers are slow speed (600 r.p.m.) units



Stanley Portable Electric Polisher

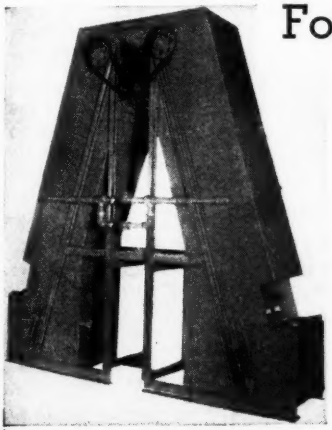
for which proper brushes and compounds have been developed for maximum efficiency.

Brushes have been developed by The Osborn Mfg. Co., Cleveland, Ohio. A No. 2588-S-2 brush, which is 8¼ in. in diameter, ½ in. in width, and has a very dense brushing face, is especially recommended for use with the Stanley Polishers. Up to four brushes can be mounted on arbors available with the polishers. A new polish known as Nu Steel Cleaner and Polish and manufactured by The Pynosal Laboratories, Inc., Chicago, Ill., is said to give best results with Osborn brushes and Stanley Polishers. Stanley does not supply brushes or polish, but these materials can be obtained direct from the makers.

The No. 182 polisher is a two purpose tool. It can be used as a polisher, or a drill chuck can be attached in place of the arbors to make a practical ½-in. drill. Arbors for two or four brushes and ½-in. Jacobs chucks are available. The No. 187 polisher has a straight handle and is used for polishing only. Arbors for two or four brushes are available.

Reznor Unit Heaters

A new line of gas-fired unit heaters, for use in offices, factories, storerooms, and similar places, has recently been introduced by the Reznor Manufacturing



Designing this space-saving cleaning machine is typical of the problems constantly submitted to our engineers, and which are carried through successfully to completion. We invite conferences.

For National Defense Work

METALWASH Twin Elevator Spray Cleaning Machine for Artillery Cases

This special machine is used after press operations for removing drawing compounds from artillery cases, which are then discharged alternately into chutes; and from when the cases are guided to other processes of manufacture.

The Twin Elevator Spray Cleaning Machine is particularly designed to save floor space as indicated in the illustration. Sturdy and simple in construction and fast in action.

We also manufacure Cleaning and Drying Machines, and Descaling Machines for National Defense Work

METALWASH MACHINERY Co., Inc.
27-29 HAYNES AVE. NEWARK, N. J.

Co., 179 James St., Mercer, Pa. The new heaters need no water or steam for operation and are scientifically constructed to throw heat evenly over large areas. Three types, each of which is available in five sizes to provide from 55,000 to 200,000 b.t.u., are included in the line.

The fan type heater is equipped with a four-blade, electrically-driven propeller fan. This fan, situated behind the heater cabinet, drives cool air of the room over the streamlined heat exchanger and thence into the room, the air being heated in the process. Because of its streamlined design, the heat exchanger is said to reduce air noise to a minimum and provide almost perfect heat transfer. Products of combustion are carried from the combustion chamber into the flue chamber and then to the chimney or flue and never come in contact with the air being heated.

Blower and duct type unit heaters correspond in design and operation to the fan type heater except that the blower type is equipped with a blower instead of a fan and the duct type is equipped with neither blower nor fan. The blower type is said to be especially efficient where the installation must be made in connection with duct system, because of the air resistance encountered in such a system. The duct type heater is designed especially for use in a system where the air is supplied by a remotely situated blower of proper capacity for the total number of duct unit heaters employed.

Reznor Unit Heater

All of the heaters can be furnished to burn natural, manufactured, or liquified petroleum gas, and are completely equipped with automatic controls, for safe and efficient operation.

Acme Fluorescent Lamp Ballasts

In announcing a new line of fluorescent lamp ballasts, the manufacturer, Acme Electric & Mfg. Co., Cuba, N. Y.,

YOUR BEST DEFENSE
Against
Paint Failure and Rust
METALPREP
"Used First — Makes Your Paint Finish Last"
The complete metal cleaner and rust remover for use on all sheet metal surfaces before painting. Gives a tooth to the metal for better paint adhesion.
•
Write for Questionnaire 116 in order to receive a sample suitable for your needs.
NEILSON CHEMICAL CO.
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Manufacturers of
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WHITE SYNTHETIC ENAMEL
Mar proof and alkali proof. Bakes from 150 F. to 450 F. in 10 to 30 minutes.
High reflection test. Forever white
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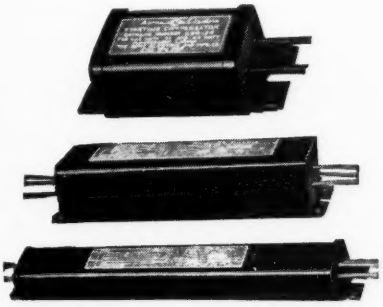
emphasizes the fact that these units provide performance characteristics that coincide exactly with the requirements of the fluorescent type lamps they are designed to power. Unlike ordinary incandescent lamps which will operate to a degree of satisfaction over a wide



Acme Fluorescent Lamp Ballasts

voltage range, the fluorescent type lamp requires exact voltage matching to perform satisfactory. The manufacturer of the Acme line claims to have achieved this important requirement, thus providing the secondary results of quick starting, humless operation.

Acme Fluorescent Lamp Ballasts are available in designs for single lamp applications of 15, 20, 30, 40, 65, and 100 watts and are also made in double lamp applications of the same lamp sizes.

Haynes Black Lacquer

A black lacquer available in either high gloss, semi-gloss, or flat is now being marketed by C. W. Haynes Laboratories, Inc., Chandler St., Springfield, Mass. This lacquer is said to have excellent build, flexibility, adhesion, coverage, resistance to humidity, etc.

Goodrich Exhaust Hose

The B. F. Goodrich Co., 450 S. Main St., Akron, Ohio. has announced a specially constructed exhaust hose for conducting fumes and abrasive dust. The hose is light and flexible, easily bent at short angles so that it may be easily placed adjacent to a machine or location from which the fumes and dust originate.

Goodrich Exhaust Hose is constructed

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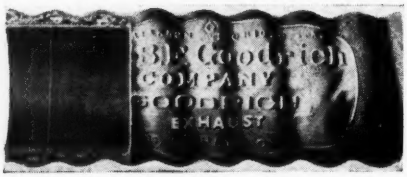

Goodrich Exhaust Hose

with smooth rubber tubing, helical wire reinforcement plies of fabric and corrugated rubber cover. The ends regularly furnished are built with a three inch extension without the wire construction to facilitate fittings. The hose is manufactured in sizes ranging from 2 to 12 in. in diameter, and in 8, 15, and 25 ft. lengths.

Goodrich Exhaust Tubing is especially compounded to resist the abrasion of dust laden air.

Corronizing

The potentialities of corronizing, an electrolytic method of plating, as a major force in the national defense program for conserving vital metals, notably zinc, were outlined recently by W. F. Rockwell, Chairman of the Board of Standard Steel Spring Company, Coraopolis, Pennsylvania.

"The corronizing method reduces plating metal requirements, notably zinc, by as much as 90 per cent, without sacrificing corrosion resistance or durability," Rockwell stated. "This metal-conserving process might be private industries' answer to an appeal from Priorities Director Edward R. Stettinius, Jr., to non-defense users of metals to cooperate voluntarily by seeking substitutes or curtailing production," he said.

Licensee rights to the corronizing method of plating have been issued by Standard Steel Spring Company to several large industrial organizations. These include Republic Steel Corporation, Outboard, Marine and Manufacturing Company, Robertshaw Thermostat Company, and Hanover Wire Cloth Company.

Application of the corronizing process for extending the usage of certain vital metals essential to phases of the national defense program has been presented to the Council of National Defense, Rockwell announced.

Want to Improve Your Paint Job?

At no extra cost you can give your customers a better, longer-lived paint job. RUSTICIDE "50" not only cleans but also mildly etches and effectively rust proofs the surface. This inexpensive, non-toxic liquid is easy to handle, removes grease and rust, leaving an ideally toothed surface ready for immediate painting. Write us discussing your operation and we will send complete data. Rusticide Products Co., 3125 Perkins Ave., Cleveland, O. Est. 1920.

Black and Decker Super-Powered Vacuum Cleaner

The Black & Decker Mfg. Co., 720 Joppa Rd., Towson, Md., has placed on the market a super-powered vacuum cleaner for industrial use to be known as the "No. 95 Vackar." This unit is powered by a one h.p. motor which drives a three stage centrifugal fan. This centrifugal fan is said to have a sealed vacuum pull of 65 in., and draws 60 cu. ft. of air per minute.

"Machine - Glazing" KNIVES with "Indian Brand" 4F Turkish Emery

24 blades are polished at once with 4F Turkish Emery at the W. R. Case & Sons Cutlery Company, Bradford, Pa.

Absolute uniformity, longer wear and prompt delivery. *Write for your trial lot today.*

HAMILTON Emery & Corundum Co.
CHESTER • MASS.

Black & Decker Super-Powered Vacuum Cleaner

With both inlet and outlet hose connections, the Black & Decker Super-Powered Vacuum Cleaner can be used as a vacuum cleaner or a blower. A system of baffle plates and filters specially adapts this Vackar to wet cleaning. The motor and mechanism are completely protected from moisture. Thorough filtering of air provides completely clean air for blowing operations.

The dual service of the Vackar as cleaner and blower is said to adapt it to all types of industrial cleaning. The unit is said to be completely self-contained, and roll easily over rough floors on ball bearing swivel casters. A 15 ft. flexible hose provided with the unit is said to easily reach out-of-the-way corners.

Nylon Edging Brushes

Nylon brushes especially designed for use in porcelain enameling plants for brushing out margins on the top coat of the "sprayed-on"enamel before the final baking operation have been placed on the market by the Plastics Department of E. I. du Pont de Nemours & Company, Wilmington, Delaware. These brushes are known as "edging" brushes and are made by stapling one to eight rows of bristle to a wooden back.

Exceptional resistance of Nylon bristles to abrasion is said to be of special value in the edging brushes for the porcelain enamel industry.

Ultraluminum

A ready mixed finishing material which is said to provide a continuous, uniform protective coating for all metals, to be known as "Ultraluminum," has been placed on the market by Thormac Chemical Company, Inc., 60 E. 42nd St., New York, N. Y. This finish is said to be unusually flexible and under severe operations will not crack, chip, or peel.

NALCO DRITHERM
CARBON FILAMENT LAMPS
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Nalco Dritherm Lamps are the carbon filament type...proved for years in therapeutic and industrial practice as providing maximum emanation of infra-red ray within the desirable penetrating band. Made only by—

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BETTER
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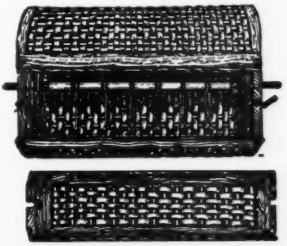

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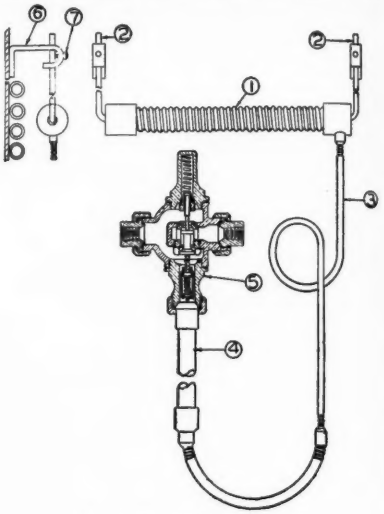
Ultraluminum provides a beautiful platinum-tone finish which is said to be non-toxic, resist corrosion and most acids.

Ultraluminum can be applied to a clean metal surface without the use of a primer. The best results are obtained when the coating is baked at 500 to 550 deg. F. by means of indirect heat for 15 to 30 minutes. In some applications, this finish can be air dried.

Sarco Vapor Line Control

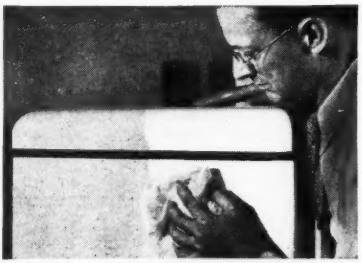
A vapor line control designed specifically to control the heating medium on degreasers has been placed on the market by Sarco Company, Inc., 183 Madison Ave., New York City. It is the function of this control to automatically maintain the correct vapor line regardless of variations in load and intermittent operation. According to the manufacturer, this saves solvent, prevents boiling over of vapors, and prevents the formation of rust in the degreaser.



Sarco Vapor Line Control

Sarco Vapor Line Controls are self-contained and self-operated by the liquid expansion system. A novel feature is the sensitive bulb or thermostat which is formed of heavy-wall helically corrugated tubing and braced on the inside. This is said to expose a very large surface to the influence of the vapor in relation to its content, which results in very rapid response to temperature changes.

Temperature adjustments can be made by sliding the bulb up and down in brackets until the position is found for the vapor line in the tank. The Sarco Vapor Line Control is available in sizes ½ in. to 2 in. for temperature up to 400 deg. F.



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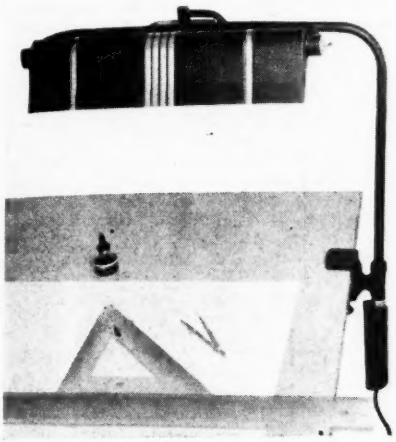
Engineers Fluorescent Lite

Marketed by The Frederick Post Co., P. O. Box 803, Chicago, Ill., the Engineers Fluorescent Lite shown in the



Engineers Fluorescent Lite

accompanying illustration is said to assure the user lighting qualities that approximate the perfect light—north daylight. Feature of the light is the special pigment-treated reflector. The reflector "artificial sky" is said to balance the heavy, blue light common to ordinary fluorescent lighting and produce a neutral colorless light that makes eye work easy.

According to the manufacturer, the Engineer Fluorescent Lite is economical to use and gives cool illumination, thereby permitting the user to work close to the light source. The light is attractively finished in Brown Matellasse with the shade trimmed in silver. Quick, positive adjustments set the swivel arm of the unit at any position from the table top up to 24 in. The shade is adjustable in a horizontal arc of 360 deg. and in a vertical arc of 180 degrees.

The Engineers Fluorescent Lite is available in two models, No. 2224A and No. 2224B. The No. 2224A light is fastened to the drawing surface by means of a clamp and the No. 2224B unit has a screw anchor attachment for permanent installation.

Phill-Co Dual Purpose Degreaser

Phillips Mfg. Co., 305 W. Huron St., Chicago, Ill., is now marketing the Phill-Co Dual Purpose Degreaser shown in illustration Fig. 1 herewith. The unit features a low temperature fluid solvent flushing chamber with 16 adjustable nozzles spraying a predetermined pattern over work up to 15 in. in diameter by 9 in. deep, and with heat selector switches and an adjustable thermostatic control for temperature ranges between

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Box of 6, $1.25; 3 dozen lots, $2.00 per dozen.

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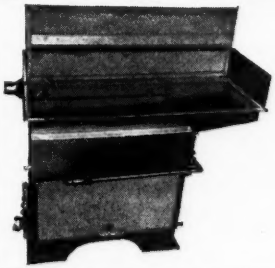

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Specialists in the use and handling of chlorinated solvents

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135 and 200 deg. F. The dual unit is transposed by the flick of a cut-over control to a straight vapor degreaser

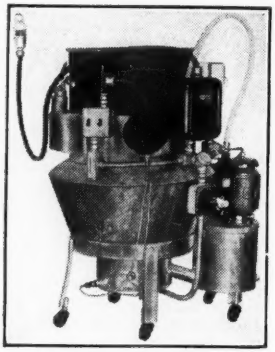

Fig. 1—Phill-Co Dual Purpose Degreaser

using Phillsolv with a vapor temperature of 249 deg. F. This phase is also thermostatically controlled and further protected by a high temperature cut-out.

For the removal of smut and oxides, work must sometimes first be degreased and then subjected to a cleaning bath of alkali or one of the many caustic or organic cleaners. For this adaptation, Phill-Co has introduced the Model 36-Insert Tank shown in Fig. 2 which, as its name implies, is merely inserted into a Model 36 Phill-Co Degreaser, one compartment then being filled with the cleaning solution and the other with rinse water. The heat of the solvent vapors keeps the alkali or other bath at a constant temperature through contact with the double wall of the insert tank, thus permitting vapor degreasing and alkali cleaning in one unit.

Phill-Co portable degreasing units are self-contained, with built-in stills. They require no water, steam, or gas connections—only electrical outlets. The units are 100 per cent electrically heated and controlled, and are especially designed for the use of Phillsolv, a chlorinated hydrocarbon solvent which vaporizes at 249 deg. F. The vapors, condensing on contact with the metal parts

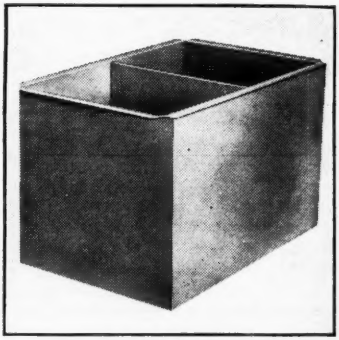

Fig. 2—Phill-Co Model 36-Insert Tank

WE RECOVER YOUR
SOLVENTS and THINNERS
from Sludge, Waste, Wash,
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AND SAVE YOU MONEY
Each shipment—one drum or a carload—receives
PROPER and SEPARATE TREATMENT.
Write to:
SOLVENTS RECOVERY SERVICE, Inc.
LISTER AVE. & BROWN ST., NEWARK, N. J.
or
HAMMOND CHEMICAL SERVICE, Inc.
241 BRUNSWICK ST., HAMMOND, IND.

UNIFORM DEPOSITS, BETTER FINISHES — USE HARSHAW ANODES AND CHEMICALS
THE HARSHAW CHEMICAL COMPANY
Cleveland, Ohio and Principal Cities

to be cleaned, flush off the grease, cutting or grinding oils.

Phillsolv, with its high boiling point, allows the work to absorb a high percentage of the flushing action. Other features of Phillsolv include great heat capacity on a weight basis, which is highly important in vapor degreasing, and heavy weight (5½ times heavier than air), which enables it to drain quickly and completely.

Phill-Co degreasers are made in three sizes which are standard models. They have solvent capacities ranging from 3 to 20 gal., and are designed to turn out from one tone of work a day to one tone of work an hour. The units can be wired for practically and electrical specification.

Sierra Flashlight Bulb Extension

To meet the need of machinists and tool operators for a closely spotted light in hard-to-see places, the Sierra Aircraft Co., Sierra Madre, Cal., has developed the flashlight bulb extension shown in the illustration. The extension is said to enter openings as small as ⅛-in. diameter and to bring light directly to objects even in restricted locations such as inside of gear trains, equipment tanks, motors, under machines, around corners, and so on. By suitably bending, illumination is directible where desired even with the flashlight laid down and the hands otherwise utilized.

Sierra Flashlight Bulb Extension

The Sierra Flashlight Bulb Extension is made of special wire encased in a high-grade aluminum alloy tubing and is supplied in lengths of from 6 to 36 in. The extension has a plug which is designed to screw into any flashlight with a bulb in the opposite socket. The extension is immersible in liquids, can be sterilized, and is readily insulated with tape for work around electrical currents.

According to the manufacturer, the Sierra Flashlight Bulb Extension is excellent for inspection under liquids. In addition, the extension is said to elimi-

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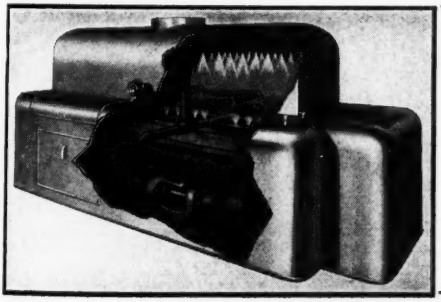

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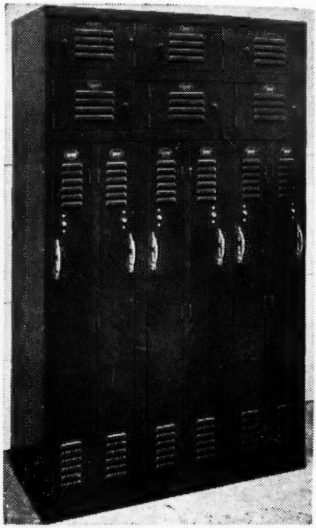
nate hazards during inspection of various equipment and machinery which has been rendered dangerous due to presence of heat, chemicals, or parts in motion.

Penco Two-In-One Steel Locker

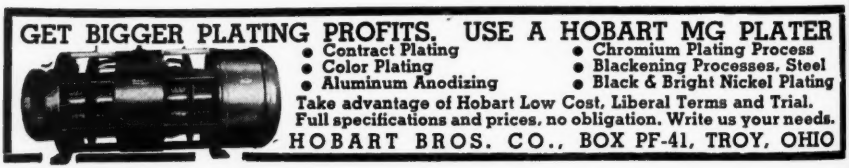
A steel locker designed for use in close quarters or any installation where a saving in floor space is an important consideration, to be known as the Penco Two-In-One Steel Locker, has been brought out by the Penn Metal Corp. of Penna., 36 Oregon Ave., Philadelphia, Pa. The illustration shows a group of three lockers providing ample accommodations for six persons.

The Penco Two-In-One Locker is fabricated from first-grade, heavy gauge furniture steel to prevent sagging or warping. Frame members are spot-welded for strength and rigidity, and, according to the manufacturer, there are no rough edges, faulty handles, hinges, latching devices, or other annoying defects. All nuts and bolts used in the assembly are cadmium finished to resist corrosion, and rubber bumpers are used at contact points to prevent damage from banging doors.



Penco Two-In-One Steel Lockers

The two-in-one locker is 15 in. wide, 21 in. deep, and 73½ in. high, including a 1½ in. base, and is divided into two coat compartments, each of which is 7½ in. wide, 21 in. deep, and 54 in. high. Each compartment is provided with two single prong coat hooks and a coat rod. The two hat compartments are each 15 in. wide, 21 in. deep, and 9 in. high. Flat key locks are furnished for each coat compartment door which, when opened, automatically unlocks a hat compartment.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Take advantage of Hobart Low Cost, Liberal Terms and Trial.
Full specifications and prices, no obligation. Write us your needs.
HOBART BROS. CO., BOX PF-41, TROY, OHIO

Barrett-Cravens Model GX "Light Boy" Lift Truck

A multiple stroke lift truck having a capacity of 2,500 lb., to be known as the Model GX or "Light Boy," has been introduced by the Barrett-Cravens

Barrett-Cravens Model GX "Light Boy" Lift Truck

Co., 3250 W. 30th St., Chicago, Ill. The truck has a full lift of 3 in. which can be obtained with either four full strokes or 13 short strokes. Each of the four wheels of the unit is equipped with ball bearings, and the front wheels are wide-spread for stability.

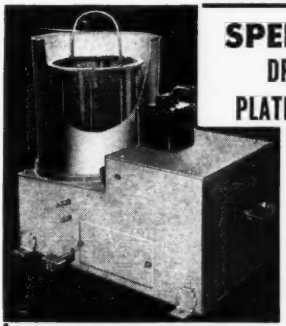
The Model GX Light Boy lift truck is made in sizes ranging from 30 to 144 in. long in multiples of 6 in., with either 6, 7, 9, or 11-in. diameter wheels; and in widths of 18 and 24 in. A Model FX lift truck, known as the "Pay-Boy," has the same general specifications and 3-in. lift as the Model GX unit, but has a capacity of 3,500 lb. Both trucks have angle lift and a spring handle hold-up.

Op-Al Infra-Red Drying and Baking Unit

A portable infra-red baking and drying unit to be known as the "Op-Al" and designed for baking or quickly drying high heat enamels on touch-up repair jobs has been placed on the market by The Op-Al Electric & Mfg. Co., 1939 Martindale, Indianapolis, Ind. The unit is equipped with four 250 watt internal reflector type drying bulbs.

The heat bulbs are mounted in a 15½ in. steel housing which is finished in black wrinkle enamel and is equipped with a switch control at the rear of the housing.

The lamps can be adjusted by means of an adjustable fork and cross slide block to any angle and from floor level to a height of six feet. The stand of the unit is mounted on a four leg base



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THIS ONE-MAN MACHINE

Increase factory output . . . Lower finishing costs. Let this modern, inexpensive machine solve your drying or lacquering problem.

Fully equipped with reversing drum switch, foot brake, ¾ H.P. motor, V belt drive, it is of all steel electric weld construction occupying 18" x 32" floor space. Gas or steam heating unit optional.

WRITE FOR COMPLETE DETAILS.

DELLINGER MFG. CO.

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ROBERTS Says: **ALWAYS ROOM FOR ONE MORE.** Your orders are always welcome here. And, regardless of size, our constant endeavor is to give them the kind of personal service and efficient handling that will keep old friends continually satisfied and bring new friends back often.

THE ROBERTS ROUGE CO., Specialists in manufacturing thoroughly dependable Gold, Sterling and Silver Plate Rouges; Stainless Steel, Chrome and Crocus Compounds. STRATFORD, CONN.

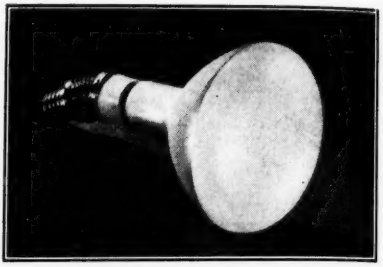
which is equipped with four ball bearing casters. Each unit is furnished with 12 ft. of rubber cord and plug connection.

For large surfaces or small production jobs, up to six units may be assembled and operated from one pedestal. For fixed production jobs, these units are furnished with attachments for mounting on racks and connections for permanent wiring.

Birdseye Floodlite

A floodlight designed for general lighting purposes, to be known as the "Birdseye Floodlite," is now being marketed by Birdseye Lamp Sales Division, Wabash Appliance Corporation, 335 Carroll St., Brooklyn, N. Y. The unit is said to deliver a concentrated flood of light in a medium beam that is especially effective in applications requiring intense illumination for exacting work.

The Birdseye Floodlite is essentially an incandescent filament bulb with a lining of pure silver sealed inside to form a reflecting surface that cannot be dulled or tarnished by dust or fumes. For localized lighting to supplement general illumination, a detachable swivel socket focuses the light exactly where needed. The Floodlite is made



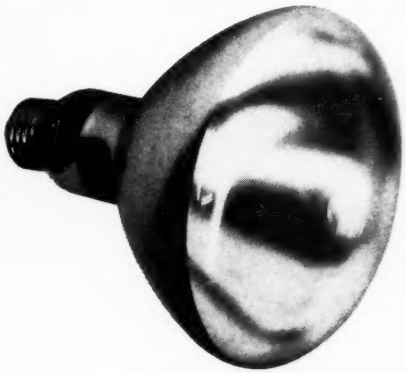
Birdseye Floodlite

in the "RE" short bulb, in four sizes and four separate voltages, from 100 to 300 watts, and 110 to 125 volts.

Hygrade Infra-Red Lamps

Hygrade Sylvania Corporation, Salem, Mass., is manufacturing the 250 Watt R-40 Infra-Red Drying Lamp for indus-

trial applications. These lamps employ a highly efficient aluminized reflecting surface on the inside of the bulb itself. This inner reflecting surface greatly



Hygrade Infra-Red Lamp

simplifies maintenance problems since it is only necessary to wipe the accumulation of dust and grime off the front of the bulb with a damp cloth.

Applications will include the majority of instances where quick drying of paints, enamels and lacquers is necessary. Special attention to each problem and specially designed frames and tunnels are usually required.

"The ABC and XYZ of Cleaning, Surfacing, and so on. by Controlled Abrasives" is a small and interesting handbook recently issued by The National Metal Abrasive Co.. 3560 Norton Rd., Cleveland, Ohio. It treats rather exclusively on metal abrasives—abrasives of yesterday and those of today; types of abrasives; difference in action between shot and grit; how shot and grit are graded; great potential opportunities afforded by "controlled abrasives;" definite characteristics of abrasives to consider when buying abrasives; how to figure the price of abrasives you buy; craters caused by peening action of shot; sizes of shot and grit troubles and their cures; what you obtain by ordering. specifying and using National Controlled Abrasives—being the more important subjects. The booklet is profusely illustrated. containing tables and charts. Copy free.

Opportunity Section

FOR SALE—1 J. O. Ross Engineering Corp. steam heated baking oven, insulated panel construction. Clear inside dimensions—11' 6" wide, 7' 0" high, 6' 0" deep, two doors in front extending along the 11' 6" wide dimension. Complete with all necessary heating and ventilating ducts, fan and motor, intake filters and exhaust stack. Temperature controlled by Foxboro heat recording instruments. Temperature up to 275 degrees. Practically brand new.
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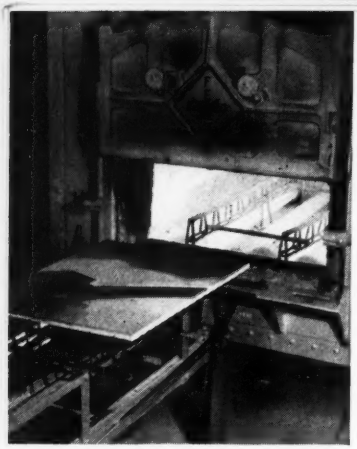

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To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Finishes for Jewelry and Novelties
Five standard finishes for jewelry and novelties, rhodium, white gold No. 2, Wite brass, and gold smut base finishes are described in a folder which is now being issued by the Alrose Chemical Company, 80 Clifford St., Providence, Rhode Island.

2. Du Pont High Speed Brass
The Electroplating Division of E. I. du Pont de Nemours & Company, Wilmington, Del., is now issuing a catalog describing an electroplating process for the rapid production of smooth, bright brass deposits.

3. Tests for Electrodeposits
A technical service manual describing the Hull and Strausser tests for the rapid determination of electrodeposit thickness of zinc. cadmium, tin, and copper is now being issued by E. I. du Pont de Nemours & Company, Wilmington, Delaware.

4. Co-Res-Co for Corrosion Problems
A four-page folder covering a scientifically formulated protective coating known as Co-Res-Co is now being issued by Corrosion Control Corp., 212 Wright St., Newark, New Jersey.

5. Textured Enamel Finish
An improved textured enamel finish known as Rincontrol is fully illustrated and described in a folder now being issued by Roxalin Flexible Lacquer Co., Inc., Box 713, Elizabeth, New Jersey.

6. Airway Ventilated Buffs
Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 21-03 41st Ave., Long Island City, New York.

7. Cleaning of Metals Before Electroplating
A 32-page booklet outlining formulas and methods for cleaning many different metals and alloys before electroplating is now being issued by Oakite Products, Inc., 20 Thames St., New York City.

8. Grinding Wheel Data Book
A 112-page catalog containing complete descriptive information about the manufacture, use and application of grinding wheels is now being issued by Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pennsylvania.

9. Finishing Equipment Catalog
A very complete catalog illustrating and describing finishing equipment of all kinds is now being issued by Industrial Sheet Metal Works, 630 E. Forest Ave., Detroit, Michigan.

10. Dust Control
A complete story of dust control in words and pictures by means of Roto-Clone dust control equipment is now being issued by American Air Filter Company, Inc., 702 Central Ave., Louisville, Kentucky.

11. General Electric Reactrol System
Eight ways in which the Reactrol system gives exact temperature control are described in a bulletin now being issued by the General Electric Company, Schenectady, New York.

12. Synthetic Resin Cements
An 8-page catalog describing Asplit Cement Powder and Asplit Cement Solution for the preparation of mortar to be used in laying acid-proof brick is now being issued by Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pennsylvania.

13. Metal Cleaning Tips
The chemical classification and selection of alkaline metal cleaners is contained in a bulletin which has been prepared and is now being distributed by the Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio.

14. Industrial Ovens
An illustrated industrial oven book featuring safety, speed, economy, and efficiency in industrial drying and finishing processes is now being issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio.

15. Mixing Equipment
A 24-page catalog describing and illustrating mixing equipment for industrial applications is now being issued by Eastern Engineering Company, 45 Fox St., New Haven, Connecticut.

16. Globe Finishing and Tumbling Barrels
One of the most completely illustrated catalogs on finishing and tumbling barrels for metal parts is now being issued by The Globe Machine & Stamping Company, 1250 W. 76th St., Cleveland, Ohio.

17. The Waco Catalyst
Volume 5 of the Waco Catalyst in which the laboratory supplies and chemicals marketed by Wilkens-Anderson Co., 111 N. Canal St., Chicago, Ill., are illustrated and described is now off the press.

18. Torit Dust Collectors
Self-contained units for carrying away dust-laden air around grinding, cutting, and polishing wheels are illustrated and described in a bulletin now being issued by Torit Manufacturing Co., Walnut and Exchange Sts., St. Paul, Minnesota.

19. Orvus for Alkaline Cleaning Baths
All those engaged in metal cleaning operations will be interested in information regarding an alkaline cleaning bath addition agent known as Orvus now being distributed by Procter & Gamble Co., Gwynne Bldg., Cincinnati, Ohio.

20. Milburn Gas and Air Regulators
A special portfolio describing Milburn single, two-stage, and ball seat type gas and air regulators is now being issued by The Alexander Milburn Company, 1436 W. Baltimore St., Baltimore, Md.

21. Hy-Speed Filter Equipment for Plating Solutions
An 8-page catalog now being issued by Alsop Engineering Corporation, 8 Bright St., Milldale, Conn., describes an entirely new approach to the problem of keeping plating solutions clean.

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I am interested in receiving the following literature reviewed in your April issue.

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